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CONNECTICUT SOCIETY
OF
CIVIL ENGINEERS
INCORPORATED

37-238

1921—1922

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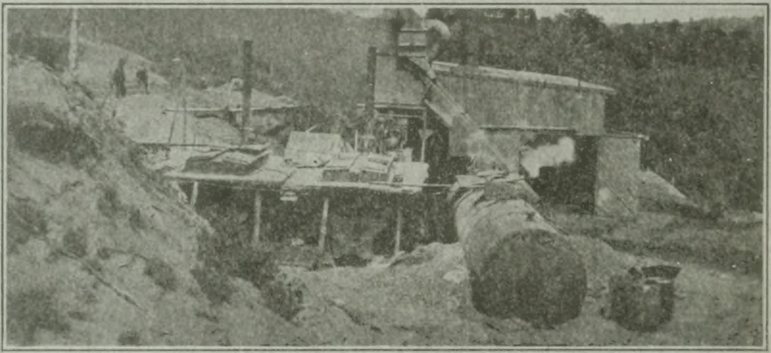
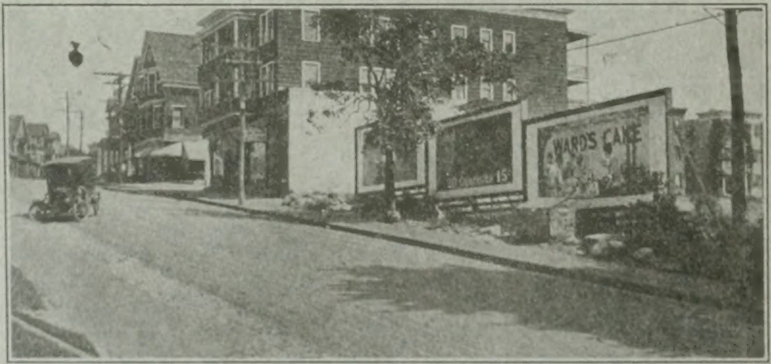


One of our Asphalt Paving Plants located at Muddy River, Montowese



Walnut Street, Waterbury, 1921. Bermuda Asphalt Penetration

The Connecticut
Society of Civil Engineers

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* * *

Papers and Transactions for 1921-1922

AND

Proceedings

OF THE

Thirty-Seventh and Thirty-Eighth Annual Meetings

AT

NEW HAVEN, FEBRUARY 15 AND 16, 1921

AND

NEW HAVEN, FEBRUARY 21 AND 22, 1922

* * *

New Haven
THE TUTTLE, MOREHOUSE & TAYLOR COMPANY
1922

The Connecticut Society of Civil Engineers,

Incorporated

ORGANIZED AT BRIDGEPORT, JANUARY 15, 1884

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*B. Hull	1884, 1885
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Charles E. Chandler	1887
*Charles H. Bunce	1888, 1889
*F. Floyd Weld	1890
E. P. Augur	1891, 1892, 1893, 1894
Wm. G. Smith	1895, 1896
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Henry R. Buck	1917
William R. Dunham, Jr.	1918
Charles J. Bennett	1919
Thomas A. Scott	1920
J. Frederick Jackson	1921
Robert J. Ross	1922

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* Deceased.

PRESIDENT'S ADDRESS.

Thomas A. Scott.

(By Stenographer.)

The Secretary notified me just recently that it would be necessary for me to make an address before the Society here, and I asked him particularly what he wanted me to say. He reminded me of the story that I had heard somewhere about someone who had compiled an address and intended to read it in the usual manner. He said it should be similar to a woman's skirt—short enough to retain interest, long enough to cover the subject. I told the Secretary I didn't think an address from me would help in any way and I would like to signify my intention of continuing my interest in the Society, but I don't think there is anything that tires one so as being chosen to lead, no matter how poor that leadership may be. It certainly creates an interest to one in the Society, and I hope you may all have the pleasure of being appointed some time.

I would like to say just a word about the procedure for this afternoon that perhaps would be apropos. I think it has been the custom of the Society in the past, in fact in most societies, to present papers that bear particularly on engineering projects, and I don't know but what in this society it is best to confine ourselves more or less to projects in this territory; that is, in the territory close at hand. My recent association with the U. S. Shipping Board brought to my attention the very great change that has taken place in our transportation vessels throughout the world. We all know the motor has stepped in and is playing a very important part. Our trolley roads are suffering from a number of diseases but still serve us. Our railroads have been taken over by the Government, shaken up and mixed up and they are now trying to unscramble the eggs. Our merchant marine is an entirely new factor which we have had to deal with before. That, of course, involves many new projects. Our port facilities have become a question of the utmost importance. Now, no engineering problem is more instructive or more educational to you as engineers than one affected seriously by transportation, and we all, from now on, have got to look upon the transportation situation as a new problem. It will affect all of your projects from one standpoint or another and I felt that it would be at least worth this year's session to give our attention to the different phases of this situation in regard to transportation, and I am very sure that from the people who are coming here, you will get some ideas that will be of value.

Mr. A. G. Gutheim, who has been President of the Railroad Executive Association, will talk here on Railroad Transportation. Mr. R. L. Dean, who is counsel of the U. S. Shipping Board, and who, by the way, gentlemen, had more to do with the formation of the merchant marine act than any other person or individual, will tell us something about shipping. Mr. R. S. McElwee of the Bureau of Foreign and Domestic Commerce will talk on Port Facilities. Mr. Charles J. Bennett will talk on motor transportation and I think you will find that the papers or the addresses will not be tied together so that it is going to be a continuous story. I don't want you to look for that, but I have felt that in presenting these subjects to engineers particularly it was unnecessary to point out to the different speakers that they would have to connect their stories in any way, for we know you would have sense enough to put two and two together and find out what the answer is. And really, gentlemen, these speakers are going to be really worth while. I am particularly interested in Mr. Gutheim, especially because he is a man who played checkers with all the railroads during the war and he had some wonderful problems. I hope he will talk about some of the problems he had during the war although I haven't the remotest idea how he will line up but I am sure he is going to be with us; in fact I know he has registered at the hotel. The one regret of the day, however, is this letter that I received yesterday. The Secretary told me that he thought both of us would be shot.

(Mr. Scott then read letter received from Mr. Goethals.)

I saw Mr. Goethals at the India house some two weeks ago and told him we were very much disappointed at his not being here with us last year because he increased our attendance wonderfully and I felt that he ought not to fail us this year, especially because he did last year. He said, "I will be willing to come and give a talk but don't ask me to talk about shipping. I will talk on canal tolls, and I think you will find that there will be plenty of engineering on that; and if you then want to ask me any questions on that I will be glad to have you do so." So I looked forward to a grand time with General Goethals as he is a very charming man to meet and an all-around excellent kind of a man, and I know you all would have enjoyed hearing him.

Mr. H. McL. Harding, Consulting Engineer of the Harbor Commission, Milwaukee, Wis., will give an illustrated lecture on Docks, Quays and Piers.

I also want to say just a word about our Secretary and Treasurer. In his various reports he said some things about me that are not so. I don't want to make the charge serious enough to affect his election in any way but he does say things. He has given me credit for a lot of things I haven't done and this is the first time he has been shooting since I have been President; the first time he has any ammunition; blank cartridges half the time; the first time this morning that he has made definite statements. I believe he has had this job so long that he looks upon the President as a mere tool and put down here to suit his presence. He has accused me of everything except a shortage in my accounts. I haven't paid my dues yet and expect I will hear from that to-morrow. However, I have shot for him and I guess there will be no regret on that point. The Secretary's interest is all with the Society and I really don't know what we will do without him and if he ever wants to get out as the Secretary and Treasurer we will have to let him but must put him somewhere else. He is the backbone of the Society.

Gentlemen, I don't want to go any further here; there may be some business that we would like to take up at this time and I am sure that is the case. I should like to open up the meeting under "Miscellaneous Business" and I think it would be a good time for us to discuss any new projects we may have for the benefit of the Society.

THE RAILROAD SITUATION IN THE UNITED STATES.

Mr. A. G. Gutheim.

Mr. Chairman and gentlemen,—I feel that I owe you all an apology. Mr. Scott spoke of the papers and I take it that means an engineer's prepared papers. I received word in Chicago last week definitely that I was to be here and I have not prepared a paper but I will follow the advice of Mr. Scott and try to go over the question somewhat generally.

The man outside of the railroad situation thinks it is a question and the man inside the railroad situation knows it is a series of questions. We have the labor question, the service question, the question of rates and the question of finance, and just now, if you talk to a railroad executive he will tell you the real important question is the question of ready cash. There are very few men in the railroad service who are sufficiently posted on all these various phases of the railroad question to be able to talk intelligently on the whole subject, and certainly a man would be rash to try to cover the whole subject in speaking to engineers, the foundation of whose business is decision and accuracy.

If you will let me indulge in the personal pronoun, I will say that after ten years or more of railroad service in New England, I spent some ten years in the service of the Interstate Commerce Commission and then was dropped overnight into the work of a railroad war board and graduated overnight from that into the work of a railroad administration, and passed from that to the work of the American Railroad Association which took up in Washington, at the close of Federal control, some of the continuing operation that had been done by the Railroad Administration.

In the long run the value of any railroad to any community and the value of the railroad plant of this country to the people of the United States is measured by the ability of the machine to give you adequate transportation at fair and reasonable rates. If there is anything that is axiomatic in railroad service it is this. That whenever you have a shortage of service every patron of the railroad is perfectly willing to pay any rate and any fare to get service, but just as soon as the scene shifts and you have a surplus of service, everybody begins to fuss about rates and the fares, and if you need any demonstration of an axiomatic truth you can find it in the experience of the railroads in the last fifteen years. In 1906 and 1907, you may remember, this country hit the crest of the boom wave that followed the panic of the late nineties, or rather of the years '93 to '97, and the result of that boom was that the transportation offering to the railroads in 1905, 1906 and 1907 was much in excess of their ability to take care of it, in consequence of which we went into a period of great shortage of car service, the first great car shortage that was of any consequence that the country had experienced in many years. In consequence of that car shortage the railroads purchased several hundred thousands of cars in the years 1905 to 1908, and with the slump in business, beginning after the paper panic, which I think was in the fall of 1907, the railroads found themselves for a period of many years with a very extraordinary car surplus. There was at all times a surplus of facilities over and above the big demand year in and year out from about 1907 up to the middle of 1916. By 1916 we began to feel the effects of the European war in the industries of America. Now, in those years, from 1906, 1907 and 1908 up to 1916, if you can recall it, I think you will agree with me that it was a period in which the railroad rate situation was fought over intensely all over the United States. Everybody seemingly would fight and bleed and die, if necessary, in order to get a reduction of a cent or a half-cent a hundred pounds on manufactured goods and to escape an increase perhaps of a few cents on a number of tons or cars. It is remarkable, when you bear in mind how the rate situation has shifted in the last few years, to think how many days and weeks and months were spent in hearings and arguments and the presentation of briefs in this country on rate increases, involving a very small sum of money as shipments go nowadays. For instance, the famous 10% rate advance case in 1910 did not involve, I believe, one hundred million dollars and the famous 5% case of 1913 did not involve but about fifty million dollars. Those sums, as we speak nowadays, are hardly worth mentioning, and still days and weeks and months were spent in fighting them out. Now, since 1916, we haven't heard much on the rate situation until this last summer. We have had advances over and over again and they were absorbed in industry or in shrinkage of profits or by saddling them on the consumer; but hardly a word was said comparatively with all of the words that were spoken, on the rate question, than in the preceding last fifteen years. The reason was that at the beginning of 1916 we had a car shortage period, and any of you gentlemen who have had experience in shipping or receiving freight know what that means. Industry throughout the period of the war went booming ahead; the railroads had not boomed for some years. I don't want to re-hash or fight as to who was responsible but the facts are that for a number of years that preceded the time of the tremendous demand for transportation that came upon us during the summer of 1916, there had not been the customary development of the railroads plant of this country. The boom came, the earnings went up and when the railroads got to the point where they wanted to spend money they found themselves to a very considerable extent pre-empted by the industries of the country, who obtained the money they wanted for the manufacture of munitions for the European war and were able to pay higher prices than the railroads could afford to pay. When we got into the war, there were other matters which were deemed more essential and you gentlemen know what happened then. We went from a period of intense car shortage that lasted until this last summer into a period of intense car surplus. The surplus averaged daily, I think, a maximum of 450,000 freight cars along in March and April of 1919. At that time the railroads were under Federal control, the Government was shouldering the burden and the only real difficulty that was anticipated or that was experienced was this—that the slump from the peak of industry had gone so far to the other extreme that everybody figured that when business picked up again we would repeat what we had gone through in the previous two years and that is exactly what happened. From about July, 1919, until about the middle of December, 1920, we went through another one of these convulsions in the shape of a car shortage and again there was very little said about the rate situation but everybody was crazy for service. The recent extraordinary advance in freight rates and in passenger fares by the Interstate Commerce Commission was made effective during the heighth of the demand on the railroads for transportation facilities. About the first of September and in September and October there was loaded on the railroads in this country, well up in the neighborhood of nine hundred thousand cars, and in October in the big weeks we touched a million cars. Then we went into another slump. As long as business was good there was a fair chance that the rates which had been fixed by the Interstate Commerce Commission with the idea of furnishing to the railroads a statutory rate, which the railroad act, effective March first last, gave them,—there was every expectation that those rates would be sufficient. There was, to be sure, some trepidation that the rates and fares for passenger service would result in the falling off of travel and cause a reduction in consequence of passenger revenue. That is a matter that is always open for argument but the fact remains that after the peak was reached in October we started to slide again. We got out of the car shortage period and into a car surplus period in the middle of December and by middle of February we were again in a car surplus period in the neighborhood of up to 350,000 cars per day. Now, gentlemen, in your profession you know the virtue of carrying an even load and you know the vice of tremendous peaks and deep valleys. The transportation business of this country has been done for the past several years with the peak as you see it way up here and the deep valleys way down here.

As late as the second week in December we were producing in this country and had been for several weeks previous twelve million tons of bituminous coal per week. Last week the figure was down to under eight million tons and the slump seemingly has not ended yet. The difficulty is that if the slump continues, we will very likely, if business comes back as it did in 1919, go into the same difficulty by the middle of next summer that we started in the middle of the summer of 1919 and previously in the midsummer of 1916. The railroad plant of this country is not today in the position where it can do business and handle it adequately and promptly on the basis of a million carloads of freight per day in late October and about 600,000 carloads of freight along in the last week in January. Now, bear in mind that you have had all through this war a tremendous and wonderful expansion of all industrial activities in the United States. You can take concrete instances on certain railroads. For instance, take Eastern Kentucky on the Louisville & Nashville railroad, which was hardly opened up to coal traffic in 1916, a country where railroad operation is of the most severe character, and in 1918, during the war.

they not only were handling about five hundred cars of bituminous coal per day out of that territory, but the Fuel Administration and the War Industries Board called upon the railroad to reach to other territories and take two hundred cars more per day because that particular coal was extraordinarily necessary for war purposes. Instances of this kind can be shown over and over again all over the country. These have developed industry but there have been no developments of railroads. Now that is the fact and the upshot of the whole thing is that the railroad plant today may be sufficient to handle all the business of the country if it is offered in fairly uniform amounts, month after month. There is even some question about that I will admit but it certainly is not adequate to handle it in the way in which it has been offered and it never will be. To my mind it never should be because to carry a railroad investment that would handle with the same adequate service the loading of a million cars of freight in late October and six hundred thousand cars in January would mean a tremendous investment for the purpose of doing business for a short time only, and that would also bring about another situation with the railroads, the question of when and where they would store their equipment. Now, as to the present rates and the present fair schedules. There is a good deal of argument going on with respect to whether or not the present rates and fares are such as to deter traffic from moving and as to deter travel, as to their effect upon freight movement, etc. There is always a good chance for argument and much can be said both ways. My own opinion is that there is just about so much freight that will move and that will move regardless of rates. There is some other freight which represent commodities going into industries that can be deferred but will not be deferred indefinitely, and there is that further phase of the situation; that a high rate with a long haul that, owing to lower rates, might have been utilized to put more competition into the same consuming market. As to the passenger fares, I think I can best illustrate it by telling a rather crude story that is going the rounds in the South. Whether or not it has reached this part of the country I don't know, but the story is that at a country station in South Carolina a darky boy inquired of the agent the price of the round trip rates to Charleston. He then bought two round trip tickets and then told the agent that the second ticket was for a corpse, the body of one of his family that had died. He said they had so many relatives in Charleston that wanted to see the body that it was much cheaper to take it there before it was buried than to have them all spend the money for the railroad fares to come here to see it before the funeral. That is precisely the case where passenger travel would be deterred somewhat. Now, I don't believe it is necessary to recite a lot more history. I take it that what you gentlemen are interested in mostly is whether there are any concrete ideas that spell something in the way of improvement in the future. To my mind, if there is any thing I would like to leave with you, it is this idea that it is hopeless for the country to try and expand industrially if you don't have the same expansion in your transportation. This is a country of long distances and the passenger hauls and the hauls of freight in this country far exceed the hauls anywhere else. We utilize transportation perhaps to a greater extent than any other country. That is clearly shown by the tremendous consumption of bituminous coal for fuel in the United States. Now you can expand your industries all you please; you can open mines in Eastern Kentucky that can produce fifteen hundred cars per day and the railroads can haul that coal north and south and east and west but it is hopeless to think of getting it there if your railroads can't handle but five hundred cars daily. You have probably heard more in the last year, in the last several years, about the car shortage in coal mines than in any other one business relating to transportation. There is a great deal of chance for a car shortage at a coal mine, but what difference does it make if the mines in this country can produce seven or eight hundred million tons of bituminous coal per year and the railroads cannot haul more than five hundred million tons? That is the real measure of your ability in the United States to produce coal and that is also the real measure of your industrial plants all around—the ability to reach a market, and to reach that market you have got to have transportation. It is foolish, therefore, to let your transportation stand still and feel that your industries will expand. You will merely find that your industries will expand somewhat perhaps and probably at the expense of some other competitive industry. That is what it amounts to in the long run. I feel, therefore, that what I would like to get home to you men particularly, men in the engineering profession, for I think you understand these questions better than most, is to get this idea of a balance, a necessary balance, between industry and transportation; and to get that balance out I think it is necessary in some sections of the country to change the public viewpoint. We have had regulation of carriers in the United States for many years, for over half a century in some of the states, and by the federal government for over thirty years. Personally, I think the regulation by the federal government has been pretty good regulation. I think there are very few men in the railroad service today who would care to go back to the unregulated period, but when you consider transportation and industry, there are some absurdities in the regulation. Take this question of coal again. The bituminous coal produced in this country is consumed to the extent of about 35% of the whole by railroads and public utilities. Your railroads and public utilities have an income which is pretty nearly fixed by law but the amount they pay for coal isn't regulated at all. Now, I am not pleading for the regulation of the coal business. I know more or less about the coal business. I know there has been profiteering, particularly this last year, and, on the other hand, I can point out to you some of the largest bituminous coal-producing coal companies in this country that voluntarily fixed the price for coal last spring and didn't deliver or sell a pound of coal in excess of that price from that time on; but the point is that the railroads and public utilities sell service and their principal raw commodity is coal. Now, if you are going to be as liberal as you have been in this country with respect to coal and with respect to the raw commodities, I think the country could afford to be a little more liberal with respect to the railroads, and if it isn't, I don't see how you are ever going to effect a balance between transportation and industry, which it is necessary to have to keep the country on the proper road. To hark back to coal for a minute, let me say this. The New England lines, as you probably know, recently approached the Interstate Commerce Commission with the proposition that they should be given more revenue by way of larger differentials of the rates already fixed; that revenue to come from the territory east of the Mississippi River and north of Ohio. That is, north of that territory. This is because of the high existing costs which the New England lines are trying to meet and these costs arise because of the prices they have been forced to pay for coal. Now that is a concrete illustration of the difficulty in the view of the country toward the two industries.

Take for instance, in July, 1920, as I recollect the figures, the New England lines bought something like 335,000 tons of soft coal and paid for that soft coal almost six dollars per ton more than they were paying for anthracite coal. There is a little item of two million dollars and that has to be compensated for from somewhere. I don't want to debate on the pros and cons of the New England road situation but I do think that that circumstance is just one indication of the lack of appreciation and seems to go hand in hand with transportation, and if you do adopt a liberal attitude toward industry—and I think that is the attitude you are bound to adopt because I don't see even now the necessity of extending government regulatory schemes toward all industry,—then I think of necessity you should adopt a fairly liberal attitude toward transportation, an attitude at least sufficiently liberal to let it expand so that industry may continue to grow.

Now, in conclusion I would like to point out something particularly with respect to the change in the laws regulating the railroads from a government standpoint, from a federal government standpoint. Up to 1920 regulation was in this country largely directed toward rates and fares and safety appliances. To be sure, in 1917, there was some provision made for the regulation of service but the Interstate Commerce Commission had but little opportunity to work under that legislation before the railroads went under Federal control; that under this act that became effective March 1st last you have your regulation of rates, of safety appliances and of acts as you did before, but you have your regulation of finance, you have your regulation of service, you have your regulation of the construction of new work; in fact, the law regulates pretty nearly all the activities of the railroads. The idea seems to be in the law that, on the other hand, the railroads are to be guaranteed, as a whole, certain revenue, and that revenue was to be fixed by the rates that were set up by the Interstate Commission. We have those rates, we have those fares and we have the regulations. The regulations this last year, the regulations you have heard the most about, have been the regulations of service. There was bound to be great criticism of that service because of an attempt to make thirty inches go a yard. That is something obviously impossible and the best that can be done is to stretch that thirty inches a little bit thinner than it is at present and making it a little bit thicker somewhere else. But you have practically all phases of railroad work now subject to regulation This is coarse work and will always be certain to conflict to a certain degree with public opinion. I don't believe, however, that there is any attitude on the part of the regulating authorities other than a desire to build up our transportation machine, but I think you will get better regulation all around if the business interests of the country adopt a distinct attitude toward the transportation machine that gives every indication that they desire it shall be built up in every respect to meet the requirements of the nation's industry.

PORT DEVELOPMENT

H. McL. Harding.

Mr. President and Engineers,—This is somewhat different from an ordinary engineering address but something more like what this room was built for. That is instruction. There are today about one hundred electrical railroads in the United States, five thousand electric light companies and many electrical engineers. There are about, including inland railroad terminals, eight thousand in all. This includes marine, inland river and canal terminals. There is a great field for you men and I shall feel more than repaid for coming here today if I can only persuade some of you to enter terminal engineering. According to Mr. Harrison, President of the Southern Railroad Company, there are between 250,000 and 300,000 railroad terminals so that you will see that is sufficiently large for us to devote some attention to. What I am going to acquaint you with today is merely an outline from the beginning, from the first inspection of a railroad terminal until the final end of its construction. I will take a terminal in the South that is at Beaumont, Texas, which I think is an interesting example. Beaumont is situated fifty-two miles from the Gulf, and at Beaumont they had only eight feet of water. What did they do? Remember, this was only a small place, and then had only about 18,000 people. They dug out that fifty-two miles for which they paid five hundred thousand dollars in order that they might make Beaumont a port. At that time the statement was made by me that if they would do this, they would double their population. This was in 1905. I also said I thought it would pay, that it would be a good investment. As you know, in every city there are a number of men, capitalists, who have a lot of the money and look out so that there may be no increase in the taxes. It may interest you to know that Beaumont, since the terminal was started, has now forty-five thousand people, it is paying 20% on the total investment by the city on the terminal. The situation there is that Beaumont has a concrete terminal which will last for years and years. I was down there six months ago and they wanted to increase the size of it. These same men are now convinced that it was a very profitable investment; it proved to them to be very successful. They built it by units. Down there we make a unit five hundred feet. That is to say, we build a sea wall five hundred feet long and build it of concrete. There is nothing about it whatever that will decay or rot, and that part of it that is below the water line will last forever. Then, back of that are the sheds and then between them and the water front there are three railway tracks; back of that additional railway tracks, so that when arriving at Beaumont freight can be transferred right direct from the railroad cars to the ships. It is interesting to know, that after a good many years of study, the following will give you an idea of the greatest, quickest railroad method that can be gotten for unloading and transferring freight, quicker than any other way, and that is, using the ships' winches. Sometimes two, three or four can pull out the freight from between decks to the upper deck and then button it to a travelling crane. In that way you get wonderful speed of both the ship and the port machinery and I feel the day will come when we will be able to get ships so that we can get vertical movement as on the car tracks. It is the purpose of this paper (I am only going to read two or three lines) to analyze plans and schemes arising from the large number of terminals so that it may be possible for an engineer to plan terminals for the ports so that they will have the greatest possible speed in handling freight. Take this city. First we make a comparison of the plans. It is just the same as though you were going to lay out a city or an adjunct to this city. We would lay it out for the future. Perhaps some of it will not be built for a hundred years but at the same time we must have that plan and that is the first thing to do. There is a curious thing to know about a great many cities. Take for example the city of Nashville, Tenn. We have a flood tide of 60 feet and we have to put the railroads, etc., 60 feet above low water. In order to know how to do that an engineer is in reality finding what the other person has done and adapt it to the particular place in question. We found that in China and I point to it because that is what I am showing in these pictures and the methods may be of assistance; and I am sincerely in hope that you will take up this subject of terminal engineering. There are two or three terminal engineer papers being published the same as for the electrical and mechanical engineers and other classes of railroad engineers. Then, after we have our plan blocked out we have the answer to work out. It is generally best not to have just one plan but two or three so that a choice can be made. Probably in New Haven we have one in the extended part, and another in the center and another on the west side. Therefore you see that prevents any criticism of favoring one section or another. The whole thing is, however, to get something started. It doesn't make any difference whether we start with one unit or not. Let us take a unit six hundred feet long. Over that six hundred foot section we can handle five hundred tons of freight per linear foot per year. That would be thirty thousand tons for that particular unit. How did we get these figures. They were taken from the statistics of some twenty or thirty different cities. I was in Europe in 1913 and visited many cities. They have wonderful facilities over there in their ports. In the port of Hamburg in 1913 they gave me permission to make any photographs or collect any information I wanted from the whole port. Engineers themselves directed me. They did not know the war was coming then or of course they would not have allowed me to do so. I said that five hundred tons per linear foot could be handled. Part of the time the boats would be delayed but at the same time you can figure that out and come very close. But five hundred tons is enough to take. Why do I know that? That 300,000 tons is the correct figure. Is there any chance of a mistake if you put in one terminal to handle 300,000 tons of freight? When it is considered that 18,000,000 tons pass through New Haven in one year you say 300,000 tons is a very small amount. Remember this five hundred feet is a big terminal in itself. You, of course, can keep adding to them. Here is a curious thing. You generally make a profit on your terminal. The reports will vary but generally seem to average one-twentieth of a cent per pound transferred over that lineal frontage. There is another thing, by the way, that we want to regulate and you want to make that your duty. Appreciation of water front property. That is an entirely different aspect but I mean to come to the water front engineering, which becomes a very important factor because it is going to depend upon its area and capacity and therefore the value of the water front property should be determined that way, so that you may have the advantage from every conceivable direction, that is to say in regard to business. The next point is to give you a general idea of what it would cost for that six hundred feet and you can take it that we know that it will figure out $130 per linear foot. An engineer from the State of New York was dealing in all with something like $55. Take such cities as Buffalo, Utica, Oswego and little ones like Albany and Troy; they have some half a dozen. In building this type of wall it cost them $55 per linear foot but today it is $130. From the cost of the wall superstructure subtract the cost of the paving as this is not included. The next question is that of the warehouse. For example, if we take a six hundred foot unit we can put it in for about $200,000, in that neighborhood anyway; but that depends on various conditions and we must also figure on the railroad tracks. This terminal engineering is worked out now very closely and very exactly. If anyone comes and wants you to lay out some of these terminals you can do it. You know what engineering is in general and in taking this particular case there is nothing to learn but the complete work from beginning to end. In the first place the land down in Beaumont was a little bend in the river and covered by gum trees and many snags and of very little value. Maybe you would be interested to know that that piece of ground today is worth $700,000 or $800,000. This shows how it has increased in value. Another point you can advise your clients. In the case where there is a large amount of ground buy a greater portion than you actually need. This is done in Europe and in large cities in this country because the increase in rates will more than pay for the transportation facilities so that consequently you want to buy a large area and you will find that will pay for all expense. After you have selected and looked over the ground and have decided in your own mind, remember you have to think things over carefully, and have to be careful that you don't have any false ideas thrust upon you. Generally we drive piles to refusal. In one particular case we used about 65 foot piles and drove them down as far as they would go. Remember the great point is that we want to get as much land as possible around New Haven. There is one of the best harbors you can imagine. It is seven miles, you understand, around the water front. Then you will put casing or piles in first and build them parallel to the shore. Now, a casing is very much cheaper and likewise you will earn more money on the investment if you use casings. Then you will put in the piles. Generally, at the beginning, it is just merely a line of concrete and piles running along the shore. I can remember that particular thing as I first saw it in Beaumont. Before the war we had nothing there. Yet today more ships leave for other ports than ever before and we have earned twelve million dollars this year. All warehouses in the state are congested with freight; the question is, where is it coming from? Some comes from Chicago, Peoria and all the way up. Before this terminal was built, if you wished to send any goods from Texas to South America, you would send them from Texas to New York. New York is one of the most expensive ports in the world and it costs more to send freight from New Haven to New York than it does to send it from New York to Europe. In Beaumont they were talking of running coast lines. I said, "Don't do that, go for the foreign trade," and that city of 18,000 increased to 50,000 and later to 60,000, and I think it will be one of our largest cities just on account of their enterprise. The Texans are a little different from the rest of the southern people. They have lots of enterprise. They built three units, each five hundred feet in length. Within two months they made another appropriation of $500,000 for two more units.

There is one thing you can say about concrete and that is, it will last in salt water. I was a member of what is called the Association of Engineers. In fact, when they were here in 1912 the United States Government appropriated $50,000 to entertain them, which shows what an important association it is. They went all over the country and studied the effects of salt water on concrete. If you have plenty of silica and not too much lime, it will stand up splendidly provided you do not break into the surface. If you have a section of wall and you have a good surface and it has been properly seasoned, if you can keep this from being broken you will have no trouble at all. We put fenders in position so that nothing can strike it. Therefore, you can take it for an absolute certainty that if a concrete wall is properly built and is carefully protected you will have no trouble. I know that people can give you plenty of bad examples where they claim faults. But I know in almost every case abrasion had happened. Sometimes ice coming down the river runs up against it and cuts in and then freezes. Remember Beaumont is a place that didn't have anything at all. Yet they developed it.

About one third of Mr. Harding's paper is not given as it was of no value without the illustrations.

INCREASING COMMERCE BY PORT DEVELOPMENT.

By Dr. R. S. McElwee, Director of the Bureau of Foreign and Domestic Commerce.

Mr. Chairman and Members of the Connecticut Society of Civil Engineers,—I have been admonished by the Secretary of Commerce not to start off on any speech without telling you what the Bureau of Foreign and Domestic Commerce have done. The Bureau of Foreign and Domestic Commerce consists of three hundred and twenty people. It is the department that gathers and disseminates foreign and domestic trade promotion for Government use. We maintain abroad commercial activities and trade commerce and in Washington publish daily a paper known as the "Commercial Report." But this evening we will talk about port development. My interest personally in port development began some seven or eight years ago—not that I had not been interested before, when, as manager in Hamburg for the Otis Elevator Company I was in charge of lift and conveying machinery that that company built in ships that were being built in various yards in that part of the world and in the equipment of the terminals at that port. I had been following this manner of work long before I got into the government service as an observer, being a business man in mechanical engineering, having had to do with these engines and electrical equipment primarily, so that I am only half an engineer and a mechanical engineer at that and can hardly qualify as one of your body here. As I understand it, you are mostly civil engineers, but the problem as I shall approach it tonight, the problem of port development, is a traffic problem and I wish to present it to you as a traffic problem. When educators talk about educating young men, there are many educators or professors that always get off on the idea of character building. To me that is so perfectly obvious that we shouldn't stop when we are talking to civil engineers to say that we must develop his character. If he has no character, he won't be anybody or anything. This matter must be approached from the traffic standpoint and when you consider it as the expert in charge of the development of the port of New Haven or Bridgeport or any other point, you must approach it from the traffic viewpoint and analyze clear back into the interior of the country the freight that may be induced to move that way. Port developments in the beginning were due to the need for a maritime shipping base because freight is there for ships. Down in Washington they can order ships to go to a certain place to make a port of it but that is entirely wrong. Ships will go anywhere they can get cargo. The thing is, how are you going to induce cargo to move to a place where ships will go and pick it up and why should they go to Bridgeport or New Haven instead of Boston or New York? The only reason is that the cargo is there to get, then the ships will come and if the ships will come, that makes it easier to get more cargo. You get that and then we have the cycle built up, which creates bigger markets. This is just like the wool market or the fur market. You can go to St. Louis for your fur market and they set the prices of the world because there is the greatest offering of the goods and buyers bidding for these goods. It creates a market. New York has the supremacy over all and is domestic, because it has grown to be the greatest domestic market in this part of the world. Now, how are we going to get this cargo to come to some port that is not nationally advertised? People by force of habit ship through New York. There are some other reasons why they do, financial reasons and personal reasons. We find commerce goes through any one point because of mechanical facilities and because of the organization of business to take care of it. You can build up the mechanical side more quickly than the business side. Goods will move through New Haven if you can create the avenue of traffic through the interior of the country that will put goods down cheaper in New Haven than in New York, but that isn't all of it. You have got to handle the goods cheaper at New Haven than at New York and then you have got to make it more advantageous for ships to come here because they get a quicker turn around, one of the reasons being that a ship is worth two to four thousand dollars per day when lying idle. I am now speaking of cargo vessels. If you can induce shipping lines to save anything by going and selling the facilities you are able to build at New Haven, why then New Haven can rival New York. But it takes facilities, personnel and salesmanship. At Manchester, for instance, after they built that very expensive canal, thirty-seven miles long, Liverpool went out in the world and sold the services of Manchester, and Liverpool cargoes and the Manchester canal now do an enormous business every year. Liverpool and Manchester grew side by side because of the market they created there; offering the cargoes for ships and they did not cut into one another's business. They created new business. What sort of facilities must you have here to make it possible to turn ships around quickly to save money to the shipper in freight rates and in other expenses? Those other expenses are the most important expenses. I made some calculations on war prices and there was practically a waste of half on goods that did not go directly from the rails alongside the ships; that had to be carted from the warehouse to the ship; a waste to the railroads, to the shippers and to the shipping line. It is a wonderful thing for any port that can overcome this; go out and talk to the shippers of the west in order to divert this traffic. Let us consider, before we start to look at the pictures, the facilities that may be created for the movement of this freight. We find freight coming from the interior, coming by rail or in interior waterways or coastwise here to New Haven. That freight goes steady by jerks; it hasn't a continuous movement. It is like the movements of a gasoline engine. A gasoline engine won't run unless you have a fly wheel and in order to get this running smoothly you must have flywheels. The flywheel alongside the ship is the wharf head which Mr. Harding mentioned and showed in his pictures this afternoon and then he also mentioned the warehouses and that is a flywheel that carries over a longer period. On the Great Lakes you have coal piles that are warehouses carried over a dead center of five months nearly of closed navigation. In any port you have to carry over at least the time between sailings of certain lines; that is traffic warehousing. Then we have the warehousing of commodities between harvests. That is usually a merchandise warehousing proposition. I want to make that quite clear because when we start the pictures, I want to go rather quickly with them. You have warehouses devoted to two different functions. One is to act as a reserve for freight as a traffic proposition, holding it back away from the water front while it may be desired to work the ship in and out and hold it pending further disposition; and then in addition you must have warehouses where goods may be held by merchants pending sale and where bankers may safely render and give warehouse receipts. That is the financial warehouse. A warehouse in order to make a fit risk for bankers on warehouse receipts must give reasonable safety against fraud. That is a whole chapter, just those three things. It represents conditions along the water front in New York. At the top you will find a car float with car yards for terminal deliveries of carload lots. Those cars are pulled, as shown, into this car yard and delivery made just as would be needed in any carload deliveries in any city. The only difference is that it makes it possible to have car floats act as ferries from any point where rails are to the other side. That gives this particular car yard access to any one of the some eleven different rail lines looking into the Jersey side of the bay and that is the reason why the great army supply base was put on the Brooklyn side. The advantage of having that supply base at the rail's end of eleven different railroads that could only be connected by long expensively built lines constructed and developed overcomes a cost of probably not more than eight or nine cents per ton for car floats. These car floats move across the bay in shuttle movement. That is not a disadvantage compared with the other advantages. Now, if you drop down to the last one, you will find the car floats with cars on them, discharging goods, into narrow piers and that holds true of those four piers shown in this picture. You have car floats acting as a floating car yard and deliveries being made. Sometimes trucking is necessary over distances of one thousand feet before you get to your trucks and that is the why of the trucking congestion of l. c. l. shipments in New York. It is the end-on delivery. A truck can come alongside of every car and take freight directly and here they have to come down through this long narrow pier and get their consignments sidewise. The piers are the extensions of streets. They are narrow because the city originally had the title to the land under the water at the ends of the streets, the piers remaining more than continuous streets in New York. They were not built that way because it was economical or because that is the way piers should be built but because that is the only way they could build them at that time. When ships were small they served very well. Suppose you take that river ship down in the lower right hand corner and suppose it is a ten thousand ton ocean ship. It would take all the space on that pier which you could commandeer and all the trucking you could bring to relieve congestion on the pier and still that one ship would entirely occupy all the space. A company, working a line of four ships, for instance, making weekly sailings, would have to keep their pier cleared for their own ships because it would be impossible to put any other ships in there. The cargoes would be so greatly congested that it would be impossible to work more than one ship at the same time. In pier development never make the mistake of thinking that a one thousand foot pier will accommodate four or five ships to be worked at the same time. You cannot do it. You can only work one at a time. The pier is the most economical stage of water front development. New York cannot do anything else. They have no soft ground. I don't know your local conditions. If we can make our harbor to suit, now how will be build it? and that is what I will try to show you in the few moments of the slides.

(Lights out and slides shown.)

This is the waterfront of San Francisco where you have a natural bay and waterfront that you can do very much with. You have to build a pier system in a case of that sort because the land is not putty in your hands; you have to take what is given to you just as on Manhattan. There is no other way on the narrow river, such as Philadelphia or New York has. Brooklyn harbor has the disadvantage of putting Brooklyn into three ports, beside the city, and making four different and separate ports. The effect of having three ports in Boston, each a separate port, is making the costs as much to move freight between those different ports in Boston as it does to Havana. Take the port or harbor of Manchester, which has a basin and key system. The base keys are several hundred feet by twenty-seven hundred feet. This is not a pier system at all but a key system. At Rotterdam, it was necessary to widen the port by digging into the banks and they gradually dug in and built basins. It is peculiar that most of the discharging is done from four ships or eight ships, etc., coal vessels, etc. It is done overside in the middle of the basin; that is stream loading and not key loading. Hamburg is an example of the latter port. It is sixty-seven miles from the sea and was dug out of the mud. Some rich senators of Hamburg acquired it in the fifteenth century from the Dukes of Schleswig to whom they made a loan. The Dukes of Schleswig were never able to repay the loan and Hamburg came into possession. It was dredged from a depth of six feet to a depth of forty feet in the course of thirty years, when the freight harbor was opened. It then became necessary to build additional basins. Tidal basins; they are not dug. Then the digging went on for a few years until altogether about twelve hundred hectares or about thirty-five hundred acres of water were added to the port. The keys are anywhere from five thousand foot keys to about thirty-five hundred. A growth of harbor from dredging, until it reached a total of 1226 hectares. Now, when is a pier not a pier? The answer is, when it is a key. You may call these key piers if you wish. This key is 3,300 feet long and this is 750 feet across and these keys or piers are reclaimed land and are about 650 feet across. You get the general impression that they are huge piers, but it is reclaimed land and they were loosely referred to as piers. Little steam tugs take lighters out and heavier tugs take charge of five hundred ton barges. That system is efficient. A former dock commissioner had these maps drawn to scale and his idea was to show that New York was the greatest port in the world and he did it by drawing New York and showing all the nations of the world represented below. We have Hamburg, Rotterdam, London, Amsterdam and Antwerp, all of them covering about as much area as the port of New York and yet every one of those ports handles almost as much freight as all New York and does it cheaper. What is the matter? According to the law of diminishing returns a few large ports that can handle considerable quantities of freight are better than a lot of small ports for the same reason that one large factory is better than a lot of small factories if you don't get past a certain point in size. New York has much rock, which makes the costs so high that it is impossible to do much with it. This is a type of covered shed and has as much chance of discharging freight as if you were going to unload a warehouse all at one time. The only way you may ship it at all is to have these large lighters waiting off shore until called for. For instance, you get a miscellaneous cargo mixed up on the pier, which consists of a number of different consignments, you will have trucks waiting in line anywhere from twelve to fourteen hours to get on the pier and sometimes they will have to go away and come back on another day because they can't get the consignment out. One of the secrets of cutting down terminal costs is to make it possible to ship carloads of freight, moving by rail, to the interior or from the interior from any railroad to any pier, without re-handling, at a flat rate. That is one of the facts you want to write out and put inside your hat. That universal movement at a flat rate between any wharf and any railroad serving the port is absolutely essential to the further development of your harbor. Here is an illustration which shows a line built in such a way showing the floating bridge, the car storage yards and the car classification yards right along behind the pier. If you have a narrow pier you mustn't put your car tracks on the side of the loading; but after you have built your line you can go ahead and build such a pier as they have in Philadelphia, twice as wide as the New York pier, so that the freight can be put directly from the railroad car into this reservation for the ship and then from there into the ship. As soon as you have rail freight coming alongside on tracks without breaking open your cars, then you can have the width of your piers tripled because you have one water side and one rail side and contact in between. A pier three hundred feet wide is none too wide. In Providence they have gone further than that. Here is a point two thousand metres in area in this particular port, which would be about six hundred and twenty thousand square feet. Here is a travelling crane with which you are familiar and the car tracks, a two track pier and plenty of room to spread out your cargo, to pile those things that can be piled; that is, stuff in uniform containers that can be piled while other articles should not be tiered because it is too expensive. They become damaged in handling. Two piers were built by the army at Norfolk. There are three tracks down the center of these piers which are 335 feet in width. There are your car tracks, wires and plenty of door space. There are the freight rails and train rails. Also wharf winches and the ship winches and open storage back in the yards. The principal work in avoiding a car shortage is to remove the material from the cars immediately into some sort of a reserve. In every port there should be ample equipment on an open pier for handling heavy articles. Where the car should go alongside I believe you must have a powerful crane with a capacity of over one thousand or fifteen hundred pounds.

MR. SCOTT: Don't you consider Hamburg the most efficient layout?

Mr. McElwee: Taking it altogether, I do. Here is a barge canal terminal on the Harlem River, built on the same system at low water and is an example that should be a lesson to anyone attempting to drive down piles and thinking they are going to hold. Notice now the injured piling came out in places.

The rest of Dr. McElwee's lecture becomes unintelligible without the pictures. As it would be impossible to reproduce them a most interesting lecture is unfortunately shortened.

PROBLEMS OF HIGHWAY DEVELOPMENT.

By Charles J. Bennett, Connecticut State Highway Commissioner.

Fellow Members of the Connecticut Society of Civil Engineers.

I am sorry I was unable to spend the afternoon with you, as usual, owing to the rough and ready treatment I am getting at the Capitol. I expected to be here and listen to the talks of the gentlemen who were here from Washington and get from them an outline of the needs of the country in transportation from other means than the highways. I wonder if you realize from what these gentlemen have said how far we are behind in our transportation needs at the present time. I am not qualified to talk on water transportation nor on land transportation but this thought strikes me as I stand here before the Doctor, speaking of those wharves and piers, how little we know of the solution of the problem of transportation in this country? I think our problem is this. That we have possibly, in the past, over-developed our railroads, particularly in New York, and paid little attention to our waterways and now we are in some sort of a muddle where we are throwing practically the greater share of the burden on the highways owing to a lack of co-ordination between the other two methods of transportation. I wonder if you realize,—many of you do I have no doubt,—that in the United States at the present time there is available for the construction of highways a tremendous sum of money. The amount of work done already is comparatively small. In the nation as a whole probably not more than four per cent. of the total highway mileage is improved so that motor transportation can be carried on. Not more than 12 per cent of Connecticut mileage is improved. Now, let me set over against that some figures of motor vehicles to give you some idea of the magnitude of our problem. This is something I happened to pick up the other day. The United States has eighty-four per cent of the motor vehicles in the world or in round figures a total of seven and a half million vehicles, both passenger and truck. Reduce this to the per capita in the United States and you will have one automobile for every fourteen inhabitants. Canada has one in every twenty-one, England one for every 180 and France one for every 198. Let's go back again for the moment and consider the per centage of mileage improved in this country. Not over four per cent as against France with an improvement of a very large per centage and yet we have ten or twelve times as many automobiles in this country as they have in France. That, it seems to me, points to two things. First, that we have over-developed our transportation by motor vehicles, and second, that we are far behind in the construction of our roads. As a result of this over-development of the traffic and the under development of the highways we have a condition now which might be termed crude. We simply don't know where we are at. Now, you may say that is a serious thing for a man concerned in highway construction to admit, but there is no use attempting to kid ourselves or fool ourselves on this problem any longer. We don't know where we are standing simply because we have over-developed our motor vehicles and under-developed our service for the motor vehicles, which is the highway. We don't know our proper place in the highway for transportation. We haven't any means at the present time of finding out just where highway transportation begins and just where it ends and the rails take up the work or just where the rails stop and water comes into the problem. In this particular section of the country we have certainly been served with too much traffic on the highways and too little on the rails; and, as a matter of fact, the water transportation in Connecticut is practically negligible. The other day I was looking over some figures in connection with the port of Paris, France, and I was very much surprised to find that Paris is further back from the sea front than Hartford. Yet they made a waterway at a very great expense from the sea front, from tidewater, back to the city of Paris and are carrying a tremendous amount of freight into Paris by water. We have been doing the same thing in this state for the last four or five years on motor trucks at the expense of the public. I am coming to that particular point in just a moment. I said we didn't know the place of the highways. We do not and we don't know its value to the community. We have no means of measuring whether or not the money that we have taken from the taxpayer from bond issues or from whatever sources secured, has given us any value in return when expended for roads, and I don't know just exactly when or how we are going to find out the answer to that problem. That is one of the difficulties that we, as engineers, must solve. We are making little if no provision for the maintenance of these highways and little or no provision for the retirement of the bonds or securities which have been issued to pay for them. That brings me naturally to the development of the technical side of the question which I must run over briefly and that has been divided under two parts. First as regards the traffic and second, as regards the medium over which that traffic shall run. A few words about the traffic. There are some serious difficulties that we cannot solve unless we know what the traffic is. What it is, what it does and what it should be. We have gone ahead with the development of a tremendous amount of travelling by motor vehicles over the highways and we have taken very little concern as to how much there is and its magnitude. We have not been seriously disturbed about its effect on the service of the highways and we have not, as engineers, gone into a very serious study of what we should do to this traffic to put it in its proper place; in other words we have made very little, if any, study of the effect of traffic classified under different types. Research in the development of the highways, construction and maintenance, has not kept pace with the development of the motor truck or the motor passenger car, simply because the one was a commercial proposition and the other the proposition that is nobody's business. The solution of this problem has been resting on a few men, harassed and pushed to the extreme of their ability to try to keep pace with something that is developing faster than their knowledge; and behind them is a public which has very little concern, if you please, with the technical side of the problem and little knowledge regarding the effect of traffic on the highway. They are simply concerned with getting over the road as quickly as possible. I said that the traffic had developed faster than their knowledge. That is true, and it seems to me that it is time that some agency in this respect takes steps to establish a research bureau or department which would do more than talk about this problem and actually get right down and work it out. People simply want the roads. They have furnished the money and want them right away. Nobody cares very much about the money so long as the road comes. With reference particularly to the technical side of this traffic problem we are most concerned, at this time, with the motor truck. Some of the motor trucks running over the highways at the present time are as large as freight cars and carry almost as much weight. I know of several instances of loads over forty thousand pounds in weight. That wouldn't make so very much difference if we knew that it was economical and proper to provide highways for that load but we don't. We have not been told by any agency, known or unknown, what the limit of the loads for motor vehicles is going to be and that is one of the things that should be established. So much for the technical problem. We also do not know very much about the effect of tires on the surface of the highway. We know very little about the proper size of tires and we do not know the effect of speed on the efficiency of traffic; in other words, when you introduce a slow moving vehicle of heavy weight there is the strain of traffic which is very heavy and does very much to retard its movement. The result of all this rather indefinite knowledge has been two-fold. In the first place we have started off with a desire to have highways and to build a lot of them. We went out to get mileage. That is true in every state in the Union, to a greater or less degree. We went out to get mileage and in the rapidity of development our mileage already built became obsolete and had to be renewed. Then again, we did not have the proper knowledge of what our wants were going to be. Many states renewed their roads in insufficient strength and consequently had to renew them again. If we do not know the limit of the loads, how are we going to stop renewing them? The first thing, as I see it now, should be to develop the greatest load which will be required to be carried over the highways and then from that institute a proper research and that raises immediately this question. Shall we build a lot of lines of a light character or shall we develop a restricted system of highways at great expense to accommodate these tremendously heavy units? If we spend all our money on heavy duty pavements it would come to the point where we can't get any increase in the number of lines to be built and consequently certain sections of this country will be prevented from securing the benefits accruing to those communities from the use of motor vehicles, and it seems to me that a policy should be outlined which would reduce the weights of vehicles, put motor vehicles in their proper place and allow us gradually to extend our improvements to the outlying sections and gradually build up those sections rather than spend all of our money in the development of certain special roads.

That is part of a problem I wish to touch upon - the technical side of the road itself — and I have just mentioned that and will leave this thought with you. That so long as we have no real knowledge of the traffic, its effect on the highway, it will be impossible for us to say very much as to what is the very best type of road or what is the best road to carry something that we know nothing about. So that here again we need a very strong movement in this country, backed up by the engineering societies and by the United States Government and by the separate states, to institute a system of research which will bring to us a knowledge of the job we have in hand so that some engineer, who comes after me or after you fellows, can solve the problem.

Speeches were made by C. C. Elwell, ex-President, J. Frederick Jackson, President-elect, Clarence Blakeslee, ex-President, and H. J. Kellogg, Secretary and Treasurer.

AMUSEMENT PARKS

By Alexander S. Lynch.

Mr. President and gentlemen,—In this program that the Secretary sent you he says you may see something about amusement parks. The word "may" has been protecting me for some time. I decided to get into the amusement park business after having been a mud digger for four and a half years. I once worked with Mr. Scott but perhaps he doesn't remember it.

Now, an amusement park today is an entirely different proposition from the amusement park of fifteen or twenty years ago. When amusement parks first started up in the country they were started by circus men or showmen and the only schemes the showmen ever knew were to run games of chance or shell games. The other privileges they rented out and therefore amusement parks, so-called, got into very bad repute. Their experience in Connecticut, as you know, has been rather sad. They tried in Hartford, before the world war, to run an amusement park called Lunar Park. This lasted several years and then died. Savin Rock liquidated at ten cents on the dollar, and then the railroad unkindly decided to give it away. They gave it to a doctor who didn't know anything about amusements. We studied it, first from the need and then from the desirability. Every community needs recreation more today than ever before. Everything is being taken away from the people and practically nothing is being given to them. Our habits are being constantly corrected and somebody has to provide amusements for the people and the company for which I have worked has gone into this line of business. We have studied practically every town in Connecticut and most cities in Massachusetts with the idea of building amusement parks and the first thing we take is the desirability of an amusement park to any one location. Rather than be too general, I will confine myself to the park built at Hartford last year. Hartford, as you know, is an inland city with very limited forms of recreation. They have Bushnell Park and Elizabeth Park where people can go in the summer; Colt's Park, where they have dancing, etc.

We took over an attractive piece of ground, about twelve acres, and decided to build an amusement park. Practically every park of this kind contains a racing coaster, which you have all seen but whether or not you have considered the engineering features, I do not know. It is twenty-eight hundred feet long. The hardest part of it is to set it up while you are building it. After that you can go around and cut out parts of it without additional timber. The coaster has ninety feet incline to take cars up by chains, it then turns them loose and lets them come on home by gravity. These cars attain a speed of sixty miles an hour in certain places and average forty miles. They have handled fifteen hundred people an hour without undue confusion. It is built entirely of timber, cut and framed on the ground. We try to get away from the common black bolts and ordinary wire nails as they don't last. Then, when we have the first section finished, we raise it. That is used as a gin pole in raising the subsequent one. The tracks are built of four layers of planed yellow pine with tarred paper in between to prevent slipping and 2¼ inch flat steel rails. The cars are underslung safety cars. They have wheels that roll on a side track and the cars themselves throw on brakes so that it would be impossible for them to leave the track. The next thing we put in the park was a whip. Now the whip is a nice little thing that would make one sick if one rode in it just after dinner. It is nothing more or less than one or two cars fastened by a spring to a cable. The cable rotates around a large flat platform and on either end of the platform there is a dip of about twelve inches so that when the tubs come to the corner they are snapped around with great speed and generally shake the ladies up. Next is the merry-go-round; you all know what that is. The one we put up in Hartford cost over thirty thousand dollars. We put up a building of steel and timber, eighty feet square. We designed the plans ourselves and had them drawn up by Hartford architects. From the several builders in Hartford the best price we got was thirty-two thousand dollars without the foundations. It seemed a little bit high. We put the building up ourselves for eighteen thousand dollars, including the foundations. I merely cite that to show how the building people were bidding a year ago. Another ride is by aeroplane or what is also known as the circle swing. This consists of a windmill or water tower with a shaft in it, which is geared to an electric motor, which furnishes the power. Extending from the shaft are eight arms from which are suspended four cars. The cars are built to carry four people and sometimes are built to represent a miniature byplane, while a propeller and motor drives it at the rate of 1,800 times per minute. As one drives around, the car, by centrifugal force, flies forty feet from the ground at the rate of fifty miles an hour. Another feature is a dance hall. It doesn't seem that dancing is much of an amusement at first, but when you stop to consider that there are a thousand people dancing in one hall, that the attendance often runs up to eleven or twelve hundred people a night, you would get an idea of what a dance hall must be. The floors must be the finest and there must be at least eighty to one hundred and twenty feet of open floor. That means you can have no posts and the construction, while it must be light, must be strong. We had an old building up there that I think was built shortly after the Noah's Ark. It took 24 x 16 timbers to hold the trusses in the air. The canes. You all know what the canes are in an amusement park. They are the curse of every amusement park because they are rented out to more or less irresponsible persons. We have found out that the only way in which the canes can be properly handled is to operate them ourselves. Then we can control them and see that they are run honestly. We could then see that people had a fair chance to win. This is only another way of selling merchandise. In an amusement park you have to have something that is rather unusual to bring people. Up to this year the chief feature was riding the racing coaster. People would stay on it for hours at a time. I have seen grown men and women riding for one or two hours at a time. The only time they ride is when somebody else wants to. In the morning, when you have got a lot of room you can get only one trip. When the crowd comes up in the afternoon the people will ride six or seven times. But on the coaster in Hartford last summer, our repeat rides—that is our repeat receipts, equalled the amount of the admissions. You understand, the number of people who paid admission averaged two rides apiece; in other words, we took in fifteen hundred dollars on the platform and fifteen hundred on the gate. We decided then we ought to have something different and every amusement park is now trying to build a swimming pool and we decided to build one in Hartford. As soon as the word got out my experiences started and I think I had applications from at least sixty men who were experienced in building swimming pools and of that sixty, twenty, by actual count, all built the pool in Bronx Park, New York. All the experience they had had in building swimming pools was to go and look at an indoor pool and then enlarge it. There is nothing further apart from an indoor pool where you control your patrons and take those that are desirable and an outdoor pool where you have to take practically everybody. So far, we have been able to draw the color line on swimming pools but it is rather a delicate subject. I looked at the swimming pool in the Palisades Park and found it built in rectangular form and of concrete. I had to keep as far away from the corners as I could and with that in mind I worked up first an oval swimming pool, and that is the only one of that shape in the country, the swimming pool we built up there. It is built 320 feet on its major axis and 220 feet on the minor axis. We watched people going in bathing and eighty per cent of the people stayed in deep water. They didn't care about getting into deep water where they couldn't swim but wanted to keep one foot near the bottom so that they could stand up quickly. We made this pool in Hartford with as much of a shallow area as we could get it. There were two reasons for this. One was the question of keeping the water clear and another question of buying water in Hartford. It took one and a quarter million gallons of water to fill it. So we made most of the area of the pool, as I say, with shallow water less than five feet in depth and then put in a diving board in the deep area, about forty by eighty feet, where the depth is nine feet, giving a total capacity of about one million two hundred thousand gallons of water. Then next we had the question of purifying it and circulation of that water. We had to use it over and over again. It took twelve hours to fill the pool and in order to purify it and get recirculation. In most pools they just turn the water in one end and let it come out of the other. We worked out a system of putting inlets into the pool around the entire circumference, spacing them about twenty feet apart so that the pure water was put in on all sides, so that these were large enough to give us circulation once in every ten hours and also an overflow at the top so that the water went out the bottom of the pool continually and over the top also. That took the scum off the top of the water and papers blowing on it. We used an eight inch pump and filtered the water through three filters, Roberts filters.

They were eight inches in diameter and twenty feet long with a guaranteed filtering capacity of more than one hundred gallons per square foot per minute, and after filtering the water we gave it the usual treatment of alum and soda. The alum, after using the water continuously, changed the quality of the water so that we had to put in a little bit of soda to keep it right. The great trouble in using alum is that you are apt to get in too much and it will hurt the bathers' eyes, so that it led to the statement that there was chlorine in the water. We had to use chlorine in the purification of the water. We used an R. U. V. machine to purify the water. After filtering it we sent it immediately through the ultra violet ray sterilizer on the theory that the ultra violet rays would kill all the germs. Then we gave it another dose of chlorine, which gave us water going into the pool of purity—four thousand bacteria to a cubic centimeter. However, I think we have to get that down still lower in the coming summer, and I think we can do it by increasing the amount of chlorine that is used. That was handled by the laboratory, in Hartford, to show how the water was being treated. In addition to the swimming pool itself we thought it advisable to put a bathing pavilion around the pool and that is what we have done. We have also put in a sand beach, thirty by four feet, so that folks can get on it and play in the sand just as they do at the beach. It was also deemed advisable to install a wavemaking machine so we put in a machine that created waves and when in operation would throw a wave eighteen inches high and twelve to fifteen feet long, on the beach. That didn't prove popular with the bathers mainly because it interfered with their swimming. This pool has handled as high as twenty-two hundred people in one day without any apparent clouding up of the water. The water stays clear as crystal, if you can use that term. Now, in a park, you have got to make changes all the time. That is, you can't just build an amusement park and let it stand and expect it to run like a Ford automobile. You have to add things to it. This year we will put in an old mill. An old mill, as you know, is nothing more than a water ride, the water lifted by a paddle wheel and run by gravity through channels. These are all enclosed and quite dark. Sometimes I think that the darkness of the channels makes the ride popular. The amusement parks we have operated as a department store. That is the only way I can describe it. The park we have constructed at Hartford cost five hundred thousand dollars. No admission is charged to any of the parks. The people are invited to come and we make it as attractive as possible for them to come there. There are band concerts afternoon and evening and we also provide an outdoor act, such as can usually be seen in circuses. The people are invited to come and made to feel at home and if they spend any money that is what we want them to do but they are not made to feel that they must spend money in the park but are welcome to come and stay there without spending anything if they don't want to. In our Hartford park I think we had over two million people last summer. You could see the same people there time after time and I think we filled really a want of the city of Hartford. That is something which, if private capital doesn't do it in the future, municipalities will have to take up. In other words, you will have to provide parks for people that can't afford to visit at Mr. Turner's place at Madison. Now, just a word as to building these parks. We started about two months before the time to put them in operation. Our park in Hartford, we started at the first of the year and had it in operation on Decoration Day. Last winter, as you probably remember, was a severe one. The swimming pool was built in sixty working days, and cost us twenty thousand dollars, the merry-go-round thirty thousand and the other amusements about fifty thousand, so you will see that an amusement park is not like the old time circuses of twenty or thirty years ago but really a big business project and has to be handled just as carefully as Winchester's or any up-to-date factory. You are depending on the good will of the people and the minute you lose that, your park is lost also.

AMERICAN AIR SERVICE CORPORATION

By a Member of the Corporation.

I will endeavor to tell you of the great progress that has been made in this new service and some of its real possibilities and adaptability to engineering problems. During the war, most of the attention was given to aerial service with the result that the development of it was greatly speeded up. One of the uses of an aeroplane was in the work of an observer. Below one can see the movement of troops and report on the same. In this particular work the aerial camera played its first part as it was soon realized that photographs were much more reliable than the memory of an observer. Furthermore, aerial photographs are of indisputable accuracy. The following slides which I will show you, I am sorry to say, are not war subjects. They are some that were made since the armistice was signed and in looking at them you will have to use your imagination. This picture is sort of a bird's-eye view that was obtained in this particular kind of work. It will, however, give you an idea of how these pictures were taken. It is really the only way to get an actual picturization of large areas. Our engineers, during the war, found these of great value in picking out the locations of troops, trench forces and other things of vital importance in modern warfare. This is an estate that was taken on Long Island. This is a picture of an oil field in Texas. We have been carrying out operations in the South every winter. In Dr. McElwee's speech last night, I couldn't help but realize of how much importance the aerial view is in making studies of areas, such as he was talking about. About the biggest interest that can be seen in this particular picture is the amount of area that it covers and the angles from which they are taken, which conveys the oblique or bird's-eye view. That was taken from approximately an elevation of one thousand feet and fifteen hundred feet away from the subject. Telescope lenses are used to a great extent, which bring the subject near the picture. Color photography is something which the advertiser uses a great deal. An oblique view is used in engineering work for getting the exact condition of large areas. In the State Department at Washington they are getting to this. These illustrations are in connection with Dr. McElwee's subject of last night, in reference to dock conditions. Of course, the only way heretofore to get dock inventories was to send an engineer down to take notes and report on its condition. The aerial photograph enables you to get the whole in one picture and the surface is an exact inventory and an exact reproduction of any one district. That picture was taken over New York showing one of the Hudson River boats and it shows a crowded dock condition. A picture taken over the Olympic gives you an idea of how large that dock is. I don't know the exact dimensions of it but I think it is 750 feet long. This is a type of photographic view used in place of that of the oblique. It was found that the oblique view did not cover a large enough area for the purpose the U. S. Army authorities at Washington wanted it, so in their efforts to get a larger area they tried first the oblique, then vertical. It was only partially successful, not entirely satisfactory. I have slides here showing how difficult it is to paste these views together. The final result was that speed was not obtained in vertical photographs; looking down on a subject and reproducing everything, such as is represented on our present day maps or blueprints. These pictures are easily matched together and large areas can be covered so well that army maps are made in this way. This is New York showing the city block and the housing arrangement. The types of photographs produced during the war are not quite as clear as the pictures we now produce. That is made up of three separate views matched together. That you can see more clearly consists of pictures that have been put together. Each square represents one exposure and they alternate each other in such a manner that everything is clearly shown. That is another part of some city that was taken abroad, which we haven't the correct information on but it demonstrates the type of photographic view. The whole city of Washington was photographed during the war. Of course, we reproduced more or less of the details by that whole picture. It comprises one hundred and eighty exposures. If you will notice that picture there, you will see, almost in the very center, the Capitol. You can see the river and pick out the Washington monument and the White House. This is a type of map that was made just about when the armistice was signed. Now, on the original negatives the squares are exactly as reproduced here. We took part of an army base in France, which gives us an illustration of an army map made during the war. By the use of modern films we are able to see through haze and shadow. You can see how photographs are matched together by following the different lines of shading. We don't endeavor to take pictures under very cloudy conditions but if there is a certain cloud that is in our way and isn't of too great density, through the use of light films we are able to get the detail. There are colored pictures. Exposures are regulated according to the speed of the plane and if your plane is going at the rate of seventy miles an hour for instance, your exposures are made about one in every five or every six seconds. During the war they served to give a great deal of information to our engineers. In one instance they noticed discoloration of a certain spot of trees and attributed this to either gunfire or smoke. It led to the discovery of a concealed cannon. Another instance that I happen to know about was, that, in comparing maps, made on two different sectors, led to the discovery of a machine gun that was particularly annoying. It would not have been discovered except for the fact that the aerial camera had taken a picture of this particular spot. This is another section of Washington on an enlarged basis and is part of that other mosaic that was shown. This shows Washington generally, showing how the pictures are put together and also another illustration of how the difference in shadow was not corrected in those days. That is an illustration of how far we can see beneath the surface of the water, showing deep channels and shallow ones. It shows channels of equal depth. In some instances in shallow water it is interesting to note that sunken vessels are being located by this instead of through the use of divers. In another instance we have a concern on the west coast that is sending out aeroplanes and divers to locate schools of fish so they will not have to guess where they will start their day's work. The type of camera used to take these pictures is automatically driven by electricity and is situated in the bottom of the fuselage of the plane in a vertical manner. It is regulated to make exposures in a manner so that they can eventually be joined together. We fly along a given route and follow these lines down and we get the amount of ground covered by each exposure. In getting a large area we fly over it and then turn around and get another strip. That is the method of getting maps in strip formation. A film is used instead of plates because you can carry it in large quantities and the work of getting the mosaic depends a lot upon flying along a given route, running directly over the subjects that are to be photographed. It doesn't matter what the direction of the wind is, but if a strip is to be photographed and the wind is blowing north, the aeroplane would be flying north if possible. Of course we can take pictures flying against the wind in taking photographs. The wind helps to keep you on an even keel. This is an exposure of the type of map as we make it today giving a picture taken in Texas in the oil district. The black is caused by the dripping of oil trucks as they constantly pass over that road. The parallel lines running in that direction are really automobile and wagon tracks left in the sand, which will give you an idea of the detail picked up by the camera. Here is another picture taken in the same district. In this picture we see a country area. The small crosses you see lead down to surveyed triangles and in order to make a test of how accurate distances can be computed from aeroplane pictures, I want to say that the photographer was sent over to get this picture and then asked to get the distances or measurements of that triangle. It was surveyed and an error of only five feet was found. That will give you an idea of how accurately you can obtain distances. This is part of a city map of New York we are working on and also shows the great improvement we are working in the making of maps. Notice the traffic going down the street, how clearly that shows up. The transit lines and the trolley cars are all discernable and can all be counted. The L system is very good study. It shows a train of cars in the station at the time. Here is another section of New York—Times Square. No great amount of shadow is shown on these pictures. It is very hard to get rid of all the shadow because of the high buildings and we would have to go to a very great height to do so. But now we can obliterate the shadow to a great extent by using telescopic lens more powerful than formerly. This picture is taken at an altitude of four thousand feet, but now, through the use of this newer lens, we are able to fly at ten thousand feet instead of four thousand and get more of a flat field and less oblique. This is another section of New York, showing the library and behind it the park. In this particular picture I think you can see the pedestrian traffic. You can see how clear a picture we obtain. This is a picture such as was referred to in the Doctor's talk last night, the water section of New York. The little white specks are the docks, etc. It also shows the transit systems and all the traffic and transportation, automobiles and horsedrawn trucks, ships, barges; and everything in detail is reproduced exactly, making the most positive inventory that could be obtained. This is another section of the docks of New York and shows the Aquitania, the next to the largest passenger steamship afloat, at its pier. This is an illustration of how we joined these maps together. Before I point it out, I want to call your attention to the lines on the maps of the pictures made during the war and you can see where the pictures were joined together. In this particular picture you can notice right here at the start the fitting is almost exact. The car tracks are exact and the number of cars on the tracks are likewise exact, the lower part being verified before the upper part is put on. A more remarkable study of contour cannot be obtained in any other way and the Doctor, in his talk last night, mentioned that these pictures were an ideal way of showing up dock conditions. In connection with New Haven, he also mentioned the fact that advertising the port facilities of New Haven would be a good way to bring about better conditions. What better way could anyone obtain to show conditions? The original negative obtains whatever scale is desired and then any scale is derived from it. This is a big district and comprises about a hundred negatives, covering a large area of ground. In a more recent type of photograph, by the use of color plates, we are able to tell the kinds of trees as well as their size and it is required in the modern maps we put out. In reference to the city map again, the city of New York is obtaining its maps for the sole purpose of traffic study. The city of Hartford is obtaining a map of its street system and later their Chief Engineer is planning to use an entire survey for traffic study, housing outlay and street conditions of the whole city. In a smaller town, the use of the aerial map is useful for the study of housing conditions and of relative importance to their school problems. Besides that, we are planning on making maps for the study of port conditions and railway and terminal problems. The State Department is finding great use for aerial maps in mapping out their water resources and heretofore inaccessible land. Before the war the expense connected with this work was prohibitive and the time taken up was considerable. Now, we can obtain a map of a very large area in a comparatively short time and can do so at less cost than heretofore. In closing, I will show you some of the later pictures that were taken and illustrating the modern type of oblique for study purposes and surveys for new maps. The engineer will undoubtedly find great benefit from this service. In years past we have only been able to look around and above ourselves and have always accepted one of the problems of life as being unable to look down upon the world we live in. Now we can easily fly through the air and at the same time take moving pictures of the earth below, and there is no doubt but what many important problems will be solved in that way.

REPORT OF PROCEEDINGS

OF THE

THIRTY-SEVENTH ANNUAL MEETING

OF THE

Connecticut Society of Civil Engineers,

Incorporated

The Thirty-Seventh Annual Meeting of the Connecticut Society of Civil Engineers was held at the Mason Laboratory, New Haven, Connecticut, February 15th and 16th, 1921.

Thomas A. Scott, President, presiding.

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Meeting opened at 10:05 A. M. February 15, 1921.

MR. SCOTT: Gentlemen, the first thing on the order of procedure is the minutes of the last meeting. You understand that the minutes of the last meeting have been published and everybody has a copy.

REPORT OF THE BOARD OF DIRECTION.

MR. KELLOGG: Mr. President and Gentlemen: In making out this report of the Board of Direction, the different things happen to be so linked with those in the Secretary's report that I will give you the report as a mere skeleton and then afterwards read the Secretary's report, which will give you the Board's actions in a little more detail.

A meeting was held in June at Bishop's Colonnade at West Haven. The following men were present at this meeting: Thomas A. Scott, President; J. Frederick Jackson, Vice President; Robert J. Ross, Second Vice President; H. J. Kellogg, Secretary; Frederick L. Ford, Board of Direction; and William H. Hull, Assistant Secretary, of the officers, and Edward Gagel as guest of Captain Scott.

The summer meeting was discussed and the details left to the President. The delinquents were looked over and were given another show. At the meeting, August 11th, articles of incorporation were signed and sworn to before a notary. At a meeting on January 7th at the Hotel Taft, where the President gave a luncheon to the officers of the Society, a two-day meeting was voted with dinner at the Taft. The details were left to the President. It was the President's idea to devote the afternoon meeting to a discussion on the details of transportation.

(Voted approved.)

Mr. Kellogg then read the report of the Secretary and Treasurer.

Approved.

REPORT OF SECRETARY

Seventy five new members were added to the list in the past year. So far as I can recall that is the largest number gained in one year. The Hartford meeting was a very successful one and the papers of high class. In particular I mention the one contributed by Dr. F. B. Jewett, Chief Engineer of the Western Electric Company, which brought us into touch with the marvelous work done in the late war by our expert electricians.

At the last annual meeting it was voted to hold two smokers in the Spring. It was not done as the increased cost of getting out the last annual report, the appropriation of $100.00 for the Federal Department of Public Works and the cost of the annual dinner, over the receipts, drained the treasury. In fact the Treasurer had to borrow $160.00 for running expenses.

The summer outing has been spoken of as the best we ever had. In variety of entertainment it leads. There was the steamboat trip up the Thames when an excellent luncheon with a flowing bowl was served on board. We witnessed the successful launching of a large steel ocean steamer at Groton. Also we had an opportunity to inspect the works at Groton. A ball game with navy officers on a fairly good field. Captain Cable furnished the steamer we sailed on and a band of six pieces. All it cost us was a vote of thanks. Captain Scott, our President, tried to disclaim any right to share our thanks but he was really responsible for the whole thing.

The Society now numbers about 470. Precise figures cannot be given as changes are frequent. Three died in 1920. Prof. John E. Clark, who was an honorary member when the Society was started; Luther W. Burt, of Hartford, a charter member, William Harley Moore, Engineer of Structures in the N. Y., N. H. & H. R. R., and Joseph S. Guppy, estimator with the H. Wales Lines Co., Meriden.

The Board met last June (1920) at Bishop's Colonnade, Savin Rock, where Captain Scott gave us a fine shore dinner. Present: T. A. Scott, president, J. Frederick Jackson, R. J. Ross, H. J. Kellogg and W. H. Hull, of the Society's officers, and Edward Gagle as the president's guest. The president was voted the right to arrange the summer meeting to suit himself.

In January, 1921, we were again entertained by President Scott at the Hotel Taft. The guests were J. Frederick Jackson, R. J. Ross, R. A. Cairns, C. J. Bennett, F. L. Ford and H. J. Kellogg. It was voted to let the President make the choice of speakers.

Copies of reports from the Iowa, Illinois and Ohio Societies have been received, but not enough to go around so they will be sent to groups of members, as one copy to a City Engineering Office, and so forth. It is not likely that we will continue to exchange. We outclass them as members.

TREASURER'S REPORT.

DR.

Cash on hand	$ 571.12
1917 dues	8.00
1918 dues	48.00
1919 dues	124.00
1920 dues	810.24
1921 dues	5.00
Pins	11.00
Admission fees	156.00
Outing cash	12.00
Outing check from W. H. Hull	62.89
Check not returned	9.20
Coupons	16.29
[illegible]	3.01
Loans $100.00 and $60.00	160.00
Dinner tickets	324.00
Advertising	418.80
	$2,739.55

CR.

Annual meeting, Hartford	$ 618.40
Safe deposit box	5.00
P. O. box	7.00
Typewriting	5.00
Secretary and Treasurer	400.00
Stenographer, annual meeting	73.05
New Haven Printing Co.	119.85
The Tuttle, Morehouse & Taylor Co.	1,050.26
Rubber stamp	.50
Telephone and telegraph	10.98
Expenses, Secretary's	24.76
Freight and carting	13.59
Postage	16.34
National Public Works	100.00
Pins, summer outing	21.00
R. J. Ross, summer outing money advanced	10.52
Secretary of State, incorporation	12.50
Return of overpayments	6.25
Paid loans $100.00 and $60.00	160.00
Cash in bank	84.55
	$2,739.55

Mr. Jackson: Mr. President, it is time to bring up the matter of legislation for the General Assembly.

Mr. Buck: There is a standing committee. I did not get hold of Mr. Ford because he is in the legislature but I talked with Mr. Bush. We both of us have been watching the new bills introduced. It is difficult to find legislation which the Connecticut Society of Civil Engineers, as a body, can properly interest itself in. I ran over the bills introduced into the Assembly and there are a few, I think, that this Society might properly take action upon.

One is a bill I would like to say a few words about; and that is one directing town clerks to receive maps for filing in the land records with actual dimensions of 36″ x 60″ instead of at present, 25″ x 35″. The statute, as it stands, says that the town clerks shall provide cards or books on which the record shall be kept. My own idea is that the present size is large enough and that it makes the town clerks' records sufficiently cumbersome and that the increase to a map three feet by five feet ought not to be allowed. I think there are very few cases where maps could not be filed so that you would find all the necessary data on sheets two feet by three feet. That is House Bill No. 553.

Mr. Scott: Have you a copy of the amendment?

Mr. Buck: I have stated the meat of House Bill No. 553, so if the members are interested in refreshing themselves on the matter of land records, they can discuss as to whether or not the changes are good enough to support.

Mr. Jackson: If you agree with Brother Buck that the present size is large enough, I think it would be in order to vote that it is the wish of the Society that the law ought not to be amended.

So voted.

Mr. Buck: There is another long bill, which I would like to bring to your attention. House Bill No. 447. It is an act limiting the height of building structures in the cities and creating zoning statutes and it is something along the lines of the New York zoning law. It is more or less like the zoning statutes of any city that has them. I do not know of anything behind this zone law before the House and I don't know that this Society cares to take an interest in it.

There is another House Bill, No. 356. This is an act prohibiting the pollution of water. It is a very drastic regulation, prohibiting the discharge of any liquid into any stream in the state, which would be detrimental to fish or plant life under a penalty of from $100 up. I think it is absolutely iniquitous. There is nothing to provide for administering the bill and the state has plenty of legislation under its State Board of Health to look out for the pollution of streams under existing laws. Can Mr. Jackson tell us what there is behind that bill?

Mr. Jackson: I think that is the bill that bobs up in every session of the legislature, brought by somebody who lives in the vicinity of the Naugatuck River, generally fixing some conditions in the bill which are practically impossible to carry out. That and one other bill before the General Assembly which I understand the Fish and Game Commission and the oyster growers are going to support very strongly. It seemed to me they are all ill advised at this time. The pollution of streams can't be ended in any particular period and any bills prohibiting pollution after 1927 or some such period are practically impossible to carry out.

There is a bill to be brought up at a hearing to-day, on prohibiting fishing in reservoirs. That is of importance to any of you who are connected with maintaining purity of the supplies of the water companies in this state. It is supported by the fishermen largely, of the state, who have claimed that the waters of the state are being unjustly regulated; that the titles of the waters belong to the state and that no company has any constitutional right to prohibit a citizen of the state from exercising his right of fishing in them; but back of it is this, which is pretty important. Two years ago, by previous agreement with the State Department of Health, all water companies in the state agreed to give up and relinquish the rights that they had by special acts prohibiting fishing in reservoirs, with the understanding that the act, which went on the statute books at that time, would take their place. If this act is repealed by the present General Assembly it leaves many of the water companies without any protection or any means to regulate promiscuous fishing upon the bodies of water in which they are interested and it is a direct violation of a gentleman's agreement between the General Assembly of 1919, the water companies and the State Department of Health. I think the Society might well go on record as opposing the repeal of that bill.

Mr. W. A. Mackenzie (of Wallingford, Conn.): There are water companies, both private and municipal, who have no method or apparatus for purifying their waters. For several years we have had a rule whereby anyone who wished to fish was obliged to obtain a written permit. In that way we keep track of them and can refuse permits where we believe it essential. It prevents night fishing and camping around reservoirs.

Mr. C. Blakeslee: I hesitate to arise because I have some personal relations in this matter. I did not know of this bill coming up but feel that it is a very important matter. At the present time any fisherman may receive a permit from us—from the New Haven Water Company—to fish in any of the bodies of water which we control around New Haven and he is not deprived of that right unless he has violated some of the necessary regulations which we have made. During this last year the New Haven Water Company granted a number of permits, so the fisherman is not debarred from fishing provided he is a proper person to receive a permit. Therefore, I am anxious that this bill should not be repealed. I am in favor of the law remaining as it now stands.

Mr. A. B. Hill: I move that the Chairman of the Legislative Committee be asked to wire the committee in Hartford that the bill had better not be repealed.

Seconded.

Mr. A. M. Turner: I would like to ask Mr. Jackson whether or not he knows if the State Board of Health intends to take any action in regard to the fishing in the reservoirs in case this statute is repealed.

Mr. Jackson: The present statute, that is now subject to repeal, was passed by the General Assembly of 1919 as drawn by the Department of Health with an understanding with the water companies that they would relinquish the rights granted them under special acts. Their object in asking the water companies to do this and in seeking the passage of the act in 1919 was to secure some uniformity of legislation in relation to all bodies of water in the state used as sources of potable supply and the attitude of the State Department of Health was wholly from the standpoint of protecting the health of communities in seeking to have this legislation changed. Their attitude now in opposing the repeal of this law is from the standpoint of protection of the public health and, furthermore, it is also from a sense of loyalty to the water companies and other interests who joined with us two years ago in giving up the rights that they then possessed, which, if this present law is repealed, will leave the water companies without any rights or restriction for the protection of their water supplies.

Motion carried. Telegraphed to Committee of Legislature.

Mr. Buck: Would you care to take any action for the prevention of sewage in the streams, that may be taken care of by the State Board of Health, may I ask?

Mr. Jackson: I think it would be very desirable to have the Society stand as you have stated, Mr. Buck. There is plenty of legislation to cover that phase of the matter.

Mr. Buck: A great many of us in this room have sufficient information about how utterly impossible it is to prevent the pollution of streams. I think we should put any weight we have behind the State Board of Health

So voted.

Mr. Buck: House Bill No. 446 covering the planting and care of shade trees. This is a bill introduced by Mr. Clark, City Engineer, amending the present one, which allows towns and cities to plant trees within the highways, so that they can plant shade trees on private property not more than 15′ back from the curb and in every case with the written consent of the property owner, and at the city's expense.

Mr. A. H. Terry: May I ask if there is anything in that bill which provides for methods for accomplishing it.

Mr. Buck: Yes, there is a statute at present, which has been on the state books for at least four to six years, which allows tree wardens to plant shade trees in the highways and gives cities and towns control of those already existing in the highways and any trees that may be set out. This is in the form of a previous amendment to this act allowing cities control of trees not more than ten feet back from the street and allowing the cities to maintain such trees as may be set out under this act.

Mr. Terry: Not long ago there arose in Bridgeport the question of allowing the city to care for the trees and the Rotary Club took action upon it, favoring giving the city power to control this thing. It was too late to get it passed. This bill was to allow the city to control trees sixty feet back from the curb.

Mr. Buck: House Bill No. 529. This is an amendment to the General Statutes regarding the employment of architects on public buildings. This is an act which directly affects any civil engineer who has to do with the building of any town or city buildings. At present No. 664 of the General Statutes requires public competition for all state buildings; but that competition has to be held under such terms that no reputable architect will enter. No payment for plans submitted. And the result has been that those general statutes have been on the books for some ten years or more and have been totally disregarded. This bill has been carefully drawn up by members of the Connecticut Institute of Architects but it seems that at this time they are more interested in the question of licensing. I think the bill is very wise. The architects would appreciate any word we might feel like speaking in favor of this bill.

Mr. Scott: What is your pleasure, gentlemen? How do you feel about this, Mr. Jackson?

Mr. Jackson: I should be willing to follow the lead of the legislative committee and that of the Institute of Architects. I know what the chairman has said is so from personal experience; that the present method of soliciting of plans for public buildings, particularly in the smaller towns, is very vicious. I make a motion in favor of the bill.

Mr. Pomeroy: It seems to me that we are making too many recommendations on these things that come up, and this matter seems a little out of our province. I move that it be laid on the table.

So voted.

Mr. Buck: Here is another bill on state parks. This Society has appeared several times in helping State Park projects. Mr. Turner, the engineer of the commission, is with us and can speak his own piece.

Mr. A. M. Turner: Mr. President, I hadn't thought of asking any help from the Society this year. I would like to say a few words in regard to the matter in question and, of course, I would appreciate it if the Society feels like giving any support. The state parks now are perhaps in a critical period and a large appropriation is needed to carry on the necessary work. I don't know that the interest of the Society can properly be asked for the support of this bill. At the same time I would like to say that I think this act in this Assembly may prove very critical on certain projects. There are one or two very desirable types of land, which are likely to be divided and pass into private hands unless we can secure funds to purchase them. They are very attractive, and, in my mind, very essential. I do not think it is good economy for the state to defer such purchases at this time in the name of economy. I think the subject of land purchase is different from anything else that is before the Assembly and cannot wisely be put off. If this Society concurs with me in this opinion, I would be very glad to have its help.

So voted.

Mr. Buck: There is House Bill No. 253 concerning the examination and registration of professional engineers and land surveyors. The American Society of Civil Engineers met about a week ago and voted unanimously that a licensing bill should be passed by this session of the Assembly and raised a committee, consisting of Mr. Dunham, Mr. Terry and myself, to bring the matter before the committee. The bill was presented and introduced by Mr. Smith of the local section of the American Association of Engineers. It was pretty short notice to get it in and Mr. Smith has been trying to secure opinions of as many engineers as he could reach and of course would also like our opinions and attitudes toward it. As for myself, my attitude is favorable. It seems that nine states are licensing engineers and seventeen are licensing architects. New York has a bill passed a year ago and perhaps we can secure much better results with this one. It looks as if we would have to take out licenses from the different states. Mr. Smith is here and also Mr. Terry, both of whom will be glad to help us in the discussion.

This bill for licensing engineers provides for a special commission to be appointed by the Government to issue licenses in the same way as doctors, lawyers and others are licensed, and as it so directly affects the engineers, it should be supported or opposed at this meeting. Such a law should require the registration of all engineers, designing or construction. Such a law should not require the registration of certain employees below the heads of certain departments. It was suggested by Mr. Smith and others of the committee that the bill provide for a board of five members to serve without pay to be nominated for five years, one of the five to retire each year and a new one nominated and elected. Also a permanent secretary, to be some regular existing state official, which means practically a second public utilities commission. It has been done in other states and a list of the registered engineers sent annually to the town clerks, and it is now suggested that this list shall be printed in the state enumeration, the same as doctors, lawyers, notaries public. In addition to the other recommendations spoken of already every licensed engineer shall be required to obtain a seal and required to use it on any maps filed in a town clerk's office or on any map which would require the services of a licensed engineer. For the sake of bringing the matter up definitely for discussion at this time, I move that this Society favor the passage of a licensing law at this session of the General Assembly.

(Seconded.)

Mr. Buck: It is not intended to submit this as a fully worked out proposition. There has not yet been time to get the opinions of all the engineers. We want to get the best possible law that we can.

Mr. Mackenzie: I want to read part of Section 2 of this bill under (b) (reads) "Professional Engineering." "Any person who shall be engaged in the designing or supervising of the construction, enlargement or alteration of any engineering structure or utilities." It may require as much engineering skill and experience in the operation of railroads, waterworks, sewerage plants and any other engineering structure as it will require on the original construction but perhaps that is implied. Would it not be a good idea, however, also to include the words "operation and maintenance"?

Mr. Kellogg: Mr. Smith, would you like to say anything in regard to this licensing control? I ask the President for his permission first that you may, as you are not a member.

Mr. Scott: Very glad to have him.

Mr. Smith: I should be very glad to help, aid and assist in this glorious work as I feel it is a step in the right direction. I hadn't come here to say what the Society ought to do. I have studied this thing carefully and gotten it into some sort of a shape so as to get it in in time.

Mr. C. A. Ferry: It seems to me that this is a good time and place to discuss the details of this bill. Theoretically, I am opposed to licensing. I think there are too many laws and altogether too many commissions already. Eleven states already have licensing laws. Three states, and possibly Connecticut, will pass one this year; Massachusetts, Tennesee and Arkansas. But, of course, that is a small part of the states of the Union. But the idea seems to be gathering in volume as it progresses. The American Society of Engineers and the Federation have both drawn up laws which they hope will be passed by the different states so as to help uniformity. There is quite a difference in the character of the statutes of the different states, and it would be very much better if we could have a uniform law all over the country so that an engineer practicing in one state could practice in another. None of the laws are alike. New York has one already, Massachusetts is considering one. But each state ought to have a law so that a man in Connecticut can go across the border and practice in those states.

Mr. Terry: Mr. Chairman, Mr. Smith, with one member of his committee of the American Association, met with the legislative Committee of the Connecticut Society and went over the bill. Mr. Smith had some dealings with the Mechanical and Electrical Engineers, who had been asked about it, and if the Connecticut Society of Civil Engineers is in favor of the bill the means of dealing with the situation is with the Connecticut Society instead of one in the American Association in Connecticut. There will be one member from the Mechanical Engineers and Mr. Buck has said he can get action from the Electrical Engineers, so that there could be a joint meeting of all those associations interested to decide what is best and ought to be done in this matter. If the Connecticut Society approves passing a motion in favor of a bill of this kind, I believe that means getting direct action on the bill in question.

Mr. Dunham: I don't want to intrude on your remarks but I think the bill as it stands is not licensing but registration.

Mr. Scott: Well, it would be the same thing.

Mr. Hill: Personally I don't think there is any need of this law, and, personally, I should prefer to see it go over another legislature and see how it works out in other states; but if the majority is in favor of it they ought to have it, I suppose.

(It was then so voted.)

Mr. Ferry: In order to take some effective action, as three members of this society were appointed to go over this bill for the American Society of Engineers, I move to appoint these three members from this Society as our committee to work on this bill—Mr. Terry, Mr. Dunham and Mr. Buck.

Mr. Scott: I think there is no objection to this motion—That the three members already appointed from the American Society of Civil Engineers act for this Society also.

(So voted.)

Mr. Scott: There is a motion before the house that this committee act for this Society. Are there any further arguments?

Mr. Dunham: I move that the committee from the Connecticut Society of Civil Engineers be increased to four members, one additional to those already appointed.

Mr. Scott: A motion has been made and seconded to the effect that one more member be added to that committee.

(It was so voted.)

Mr. Terry: What action has been taken in connection with the legislative committee with regard to the licensing law?

Mr. Jackson: I don't know where we stand on this matter. I understand at present that the Society has gone on record as favoring the licensing law in the State of Connecticut. They have also appointed a committee to act for both the American and our Society in preparing and working out the details of a licensing law, and if I understand it correctly, that committee is given full power to represent the Society in every and any way in drawing up this law and that they will refer it to nobody, not even to the Board of Direction of this Society, for the committee, in its decision, is final. I also assume that there is this committee as well as the committee on legislation and that they then appear before the judiciary committee and support this bill. Now, there is nothing in this vote that gives this committee any power other than to meet the other committees and there is no way in which the Society can have any referendum on the work of this joint committee, as to whether or not the details of this bill are going to be satisfactory. I think that ought to be tied up a little more closely so that the committee can be given full power and know where they stand.

Mr. Scott: Have you any suggestions in the way of authority that you would like this committee to have.

Mr. Jackson: No, only from my own experience in the Society and for the interests of the committee it would be well to have the wording of that vote or an additional vote passed particularly that this committee has the power. I think if we look into the constitution of the Society we would find they have no power at all without referring this matter to the Board of Direction. The Board of Direction is supreme in all authority.

Mr. Wadhams: I make a motion that the committee appointed be given the power to act any way they see fit in furthering the matter of licensing bills for engineers.

(Seconded and carried.)

Mr. Scott: I will appoint Mr. Ferry as the fourth member.

Mr. Kellogg: Mr. President, what do you wish to do about the legislative committee? I suggest the reappointment of Mr. Ford, Mr. Buck and Mr. Bush.

Mr. Scott: I believe it is within the power of the chair to appoint the committee on legislation: Mr. Ford, Mr. Buck and Mr. Bush.

Mr. Scott: We have some members for election which I will ask our Secretary to announce.

Mr. Kellogg: Charles A. Bowman, New Haven; William H. Fitzell, New Britain, (Associate); Oliver Gildersleeve, Gildersleeve; James M

Lannan, Middletown; Edwin H. Lotz, Southington; Bernard A. Mehls, New Haven; Clyde A. Miller, Torrington; Samuel E. Bittner, New London.

Mr. Scott: The motion has been made that the Secretary cast one ballott for the names as read. So voted.

Mr. Kellogg: There are a number of names that came in too late for proper publication and I will read them:

(Then read the list of names.)

Mr. Jackson: I would suggest that those names go over until the next meeting of the Society.

Mr. Scott: Is there any one present who has a name of particular interest?

Mr. Hill: In regard to the application of Mr. Virgil Wardwell. Unfortunately he didn't get his application in in time to have it come before the Board. I know him personally; he is a good man. I move that the rules be suspended and Mr. Wardwell be elected.

(So voted.)

Mr. Scott: Has anyone anything further of particular interest in any other member?

Mr. Terry: I would like to ask in regard to the name of Louis Reed. Where is he working now, Mr. Secretary?

Mr. Kellogg: He is Division Engineer at Winsted. His application is signed by C. J. Bennett, G. E. Hamlin and L. G. Sumner.

Mr. Terry: Well, the endorsement is good enough for me, and, knowing the man as I do, I move that the rules be suspended in his case.

(Unanimously voted.)

(Recess from 12:00 to 12:10.)

Tellers' William H. Hull and Ernest C. Daboll announced the result of the ballot for officers.

The total number of ballots cast: 155. The number counted, 149. Six ballots were rejected for lack of signatures on the back of the envelopes.

The ballots indicate the election of J. Frederick Jackson as President, R. J. Ross, First Vice President, A. H. Terry, Second Vice President, and for the Board of Direction, H. L. Blakeslee, Secretary and Treasurer, Henry J. Kellogg.

Mr. Scott: Is Professor Tracy present?

Mr. Kellogg: May I have the privilege of reading your letter which you wrote and presented to me.

Mr. Tracy: I haven't the slightest objection but it is past history.

Mr. Kellogg: I think it is important as twenty-nine men voted for you.

(Read letter from Mr. Tracy withdrawing his name as nominee for the presidency in favor of Mr. Jackson.)

I wanted to read that because I thought it ought to be heard.

Mr. Scott: That exemplifies the spirit of the Society. I think it is a good example for all of us.

(Meeting adjourned about 12:40 until 2:00 p. m.)

(The meeting opened at two o'clock.)

The President: The first speaker this afternoon will be Mr. A. G.

Gutheim, who has been associated with the American Railway Executiv Association, also with the Railroad Administration, and all during the wa was one of the few gentlemen who were playing checkers with our railroads all over the country. He is now the Public Relation Manager of th American Railway Association and he is going to talk on railroads (page 4)

Mr. Scott: Gentlemen, I feel very sure that Mr. Gutheim would b very glad to answer any question that you may wish to ask about an phase of the railroad situation and I should be very glad to devote fiv minutes to it if anybody would like to open up any phase not covered or touched upon that might be of particular interest. I think we are very fortunate in having the whole situation placed before us in the manner he has handled it. If you don't care to discuss that, before we make any definite indication of our feeling toward Mr. Gutheim and his kindness, I have another great pleasure. During my service on the Shipping Board I was brought in contact with various committees of Congress, both in the Senate and in the House and I was there during the foundation of the new merchant marine act. When the commissioners of the Shipping Board were called before the committees, we were advised by our counsel how to approach the subject and he was always with us. He always accompanied us and served as a strong right arm to protect us against any attacks that might come from the Board's standpoint and he was a man who had the peculiar faculty of being everybody's friend. I don't believe the Shipping Board would get on at all if it doesn't have him in some capacity. Shipping in this country has become a real factor in transportation, and we have with us this afternoon the gentleman who was the particular counsel of the Shipping Board when I was there and is still associated with it. Now if you want to know anything about shipping; if you want to know anything about any Senator or Congressman or about either House he can tell you aside from what he can tell you about shipping. I take great pleasure in introducing Mr. Robert L. Dean.

Mr. Robert L. Dean: Mr. President and gentlemen,—Your President, some two months ago, in my office in a moment of adsentmindedness, suggested that I come here and talk about the shipping problem. He went out of the office, came back a little later and, knowing a tendency which I have, asked me to read a paper of twenty minutes. Two or three times since then he has looked in and mentioned the date and occasion and I began to think that he had some misgivings about my appearance here to-day. Now I was in a little trouble about that. Barrett Williams died the other day. I associated with him in college and learned from him about the shipping problem. On leaving college, I had written a long story, a ten thousand word story, and I went down to see the professor, and say good-by. I got this story out and read part of it to him and it didn't sound very good. "Dean," he said, "will you promise me something? Go out and become almost anything, a doctor, a lawyer, but promise me this from now until the time I die—that you will never attempt to write anything." I was rather disturbed at this and he said, "If you will do that, I will give you a good mark in the class." He died only last week and so I am not breaking my word after having kept it for twenty years. I followed the professor's advice and went to the Harvard Law School. One day we had a lecture on the law of jurisprudence. I was a very eager student of the law in those days so I got a seat in the front row and the speaker got up, and, I might say, in the first place was introduced by President Eliot of the university. The distinguished gentleman took from his inside pocket, can you imagine it, papers of four different colors and then for two hours he read. Now, as I say, I was in the front row. When he got all through reading, the front row only was left and the rest of the audience had vanished. I am going to keep my word and deal with this subject for only twenty minutes. I want to say one more thing for Captain Scott. It has been my privilege to go into the shipping board and to do a little of the work, and I have seen gentlemen come and go. But in your distinguished president we had a man who knew his subject thoroughly and he was a big enough man to step outside the regulations in defiance of his superiors and propose some real ideas looking toward the solution of the problems. I think in the years to come, looking backward over the sessions of these different commissions, we will find many suggestions that were furnished by your president that are of great service in solving the real problems.

Mr. Dean took his paper with him to make a few corrections and forgot to return it. It is a loss to us; but we can bear it better when we consider that we have such a quantity of matter on hand. It was very interesting. (Secretary's apology.)

Mr. Scott: Is there any one who desires to ask Mr. Dean any questions on the different phases of his subject. Mr. Dean has a very wonderful grasp of the maritime situation and he is a man, in my judgment, whom this country can ill afford to lose from the Board because of his knowledge and past experience.

It appears that New Haven is some day going to be a seaport. There is much that could be said along that line. I was in Boston a week ago last night before the new Boston Maritime Exchange and there we were discussing the possibilities of New England, and I said to these gentlemen, the meeting of the Directors of the Boston Maritime Exchange, about twenty-five I think there were, "Don't talk about Boston because that's too narrow, let's talk about New England, because then you have New England back of you instead of just Boston." That means that all of us must put a shoulder to the wheel and push if we are going to have any support. Without any particular reference to New Haven, we have got to do something if we are going to have any support. I am not going to criticize the Shipping Board, Mr. Dean, because I am for it; but the Shipping Board has created or agreed to the creation of a rate-making conference and believe it should be done in a certain way. It pays to get together and we find that the rates to your U. K. ports from Atlantic ports will be fixed at such and such a rate. I would like to quote a couple of instances in connection with that. I am not familiar with the definite figures but approximately grain from Kansas is about nine hundred miles from New Orleans, or rather from Galveston or New Orleans, I guess there isn't much difference. There is a differential as between New England ports and southern ports and it is considerable. Something like fifteen cents a hundred weight, I think, which is a tremendous item. The distance from the southern ports I have named to U. K. ports is practically two thousand miles less than it is from Boston or New Haven, yet ships sailing from Boston and New Haven are not permitted to absorb that extra freight money because of your rate-making conference that is fixed by the Government. Now, how is New England ever going to be developed unless you expect to make this extra and tremendous freight rate and that won't do. It all goes to show that in the development of New England ports, New Haven is one about which we have got to do something, and, gentlemen, we have got to do something besides talk. New York, of course, is very jealous of her shipping and New York will do everything she can to prevent any port development close to New York. The southern ports have been particularly fortunate during this last administration because of the influence which they had in our Congress, and they have created a number of objectionable things which tend to build up the southern ports, which is not justified by the economic conditions which really exist.

Mr. Dean: What Captain Scott has just said brings very vividly to my mind some of the things I have happened to be interested in in Washington for the last few years, when we had the shipping board hold these meetings in certain sections of the country and take up this proposition. If the Pacific Coast was interested in a proposition thirty people would drive across the continent and would walk in before the shipping board and say "My name is Jones or Smith and I am from Los Angelos or Seattle or Tacoma." They would present their case and would further it by men who are thoroughly conversant with the situation and would then be there also, and the psychological effect that they would have would be tremendous and would go a long way toward getting what they wanted. The South to-day is better organized than any other section of this country and they have a perfect right to do that, of course. I shall always remember a hearing we had over in the 1917 building in the big committee room. When the commission got there only one man was present from New England in a room holding three hundred people. Later in the day three senators from New England came in but where were the representatives from New England? Before the meeting was over four men appeared on the scene with a brief carefully printed and I was very much interested in reading it over and seeing what I could do for them, but that isn't enough. The next day we heard from the South. The South appeared before the shipping board with southern senators and they had ninety-four people present beside to state what they wanted and how they wanted it, and they wanted thirty-five southern ports to be developed and built up.

Mr. Scott: I am sure we are going to have an interesting session with Mr. Harding this afternoon, who is going to tell us something of the developing of port facilities. He has been engaged to make some suggestions about New Haven. He is a member of various port development commissions and he is a consulting engineer on that particular subject.

I take great pleasure in introducing Mr. H. McL. Harding of Milwaukee, Wis.

Mr. Harding's address printed elsewhere.

Mr. Scott: Gentlemen, before closing the afternoon session, I want to read a letter which I received this morning with great regret. Our secretary said he thought probably both of us would be shot but I am going to read this letter anyway.

(Reads letter from General Goethals.)

That is the second time this gentleman has seen fit to disappoint this society but I know it was because he was obliged to. I know he felt it very keenly because he was to attend our summer meeting and regretted being obliged to be away at that time.

Mr. Scott: I will ask our new President, Mr. Jackson, if he won't advise the out-of-town members as to what particular forms of interest there are in the city at the present time.

Mr. Jackson: I see I brought this upon myself. I had in mind only this; that his is an excellent opportunity for the out-of-town members to visit and inspect the Harkness Memorial building. Possibly our Secretary can tell us something about this.

Mr. Kellogg: Stone for this building was selected at great expense. This stone came there numbered and Mrs. Harkness, through her attorney, spent many thousands of dollars in selecting it. I heard it cost an extra twenty thousand dollars to get it uniform. When they laid the foundations for the big tower they sunk them down about eighty feet. It is one of the finest buildings in the country, one of the most expensive anyway, and Professor Phelps says it is the finest college building in the world. From hearing me speak of it in this enthusastic manner you may possibly be disappointed, at first. The Harkness Memorial is rather a low building. Walk around it two or three times and I think you will go away with the idea that that building is "some punkins."

Mr. Ferry: I would like to support Mr. Kellogg in that statement. Certainly there is nothing square about the building. All the stones are numbered and set in their particular places. You will notice also a great many windows open. This is not due to accidents by employees but it was the intention to leave out two or three panes and then touch them up so as to give the whole building an old look. The idea is to make the building look ancient, like a building made in the fourteenth century. That was the idea of having the stones all rusted, and you will notice the joints, instead of being nicely fitted, there are some great big things about an inch wide and look as though they had been made by a clodhopper and not a mason; and the lanterns which they have in the different corridors—no two of them are alike. No two of the doors are the same. Some of them are square, some have the corners rounded; some are put in square to the wall and some cornerways to the wall. Then there are perhaps some six to eight corners in some of the passageways. No two of these corners are alike. It was the idea to give it a very old appearance and in looking around I think you all would be very much interested in noting all these details.

Evening, February 15, at the Hotel Taft.

Mr. Scott: The announcement at this time is a prize for the member making the first reply to the invitations to the banquet to-night.

Mr. Kellogg: The prize, gentlemen, is awarded to Harry Storrs. If Mr. Harry Storrs will come this way, he will get the prize. It is a half pint of Old Taylor. In these times this stuff is sometimes dangerous so I tried it on the dog.

Mr. Storrs: Gentlemen, the dog evidently lived, so we will try some of the poison ourselves.

Mr. Scott: I don't know how this is going to affect the rest of you but I have just been informed that it will be necessary, in the interest of law and order, to make a search of the premises to try and find the culprits because it is rumored that there is "water" here that is not clear water and I have assured this officer that the Society is a law abiding body, and we have no desire to evade the law in any way, shape or manner. In order that the gentleman may have all the assistance possible, I will appoint a committee to assist him and I would like him to be perfectly satisfied that the Connecticut Society is not guilty in any way, shape or form. I will ask the Assistant Secretary, Mr. Hall, Mr. Ford and Mr. Buck, if they will kindly lend a hand in this. These gentlemen will kindly confer with the officer here. You can proceed then as you see fit.

The Officer and the Committee make investigation.

Officer: I find there are mitigating circumstances connected therewith, as follows: The prize given for the first reply to the dinner to-night was given in very good faith by Mr. Kellogg and it doesn't seem to me as if I ought to go any further. There now seems to be a lack of evidence, and in accordance with law and order we will call it square.

Mr. Scott: Will you kindly give your attention to Mr. Bunce.

Mr. Bunce: As I look over the faces here to-night at this thirty-seventh meeting of this Society I have noticed particularly the old friends and those who have given great assistance toward bringing this Society to its present excellent condition. I have in mind, among others, two men that I want to bring to your attention just a moment. I thank God that I have lived long enough to see Fred Jackson elected President of this Society after the long years of service he has given to this Society. The other is a man who is always in our thoughts and by his efforts succeeded in bringing this Society to its present conditions in a financial way; in other words, by soliciting advertisements, etc. to pay to print our books and to keep our heads above water in a financial way—my dear old friend, Henry Kellogg. God bless him!

Mr. Scott: Gentlemen, I went to the Department of Commerce to see if we could not get Dr. McElwee, who is a director of the Bureau of Foreign and Domestic Commerce. The Doctor told me that the Secretary of Commerce, Judge Alexander, was called to Chicago to speak there to-night or to-morrow night and he didn't want to go and had asked the Doctor if he wouldn't go. Therefore, the Doctor thought he ought to do as the Secretary wanted him to do. Senator Calder, however, intervened and said "No, you mustn't disappoint the boys up in Connecticut. He ought to go up there." Anyway, we won out and have Doctor McElwee with us to-night and I am going to read from a memorandum I have, something about him. (Reading.) In 1917 he was appointed a first lieutenant in the railroad transportation corps and began his army career at Camp Merritt, N. J., where, besides his other duties, he was in a section composed entirely of foreign-born men. In the following spring he was ordered to Washington in connection with port developments. Then he was put on the Army Vocation Board. Later in 1918 Bulletin 24, Foreign Trade and Shipping, was published by the Board under his direction. At the same time work of an educational nature was begun and much of his work during the year was carried into 1919. Among the other important books which the Doctor has written are "Selling in Foreign Markets," "Paper work in Export work" by Smith, Moore and McElwee, "Training for foreign Trade" by McElwee, etc. I think we are particularly fortunate in having the Doctor here to-night because his knowledge of the whole situation fits in so nicely with the problems which we have before us and I know he is going to give us many new things to think about. I take great pleasure in introducing Dr. McElwee, Director of the Bureau of Foreign and Domestic Commerce.

Dr. McElwee gives his lecture.

MR. SCOTT: Gentlemen, we are going now from port facilities to highway transportation. I didn't go to Washington to find somebody for this job. I didn't have to. He needs no introduction and it is a very great pleasure, I know, for everybody to hear from our State Highway Commissioner, Mr. Charles J. Bennett.

Speeches were made by C. C. Elwell, ex-president, J. Frederick Jackson, president-elect, Clarence Blakeslee, ex-president and H. L. Kellogg, secretary and treasurer.

MR. KELLOGG: Mr. President, speaking about that moving picture. It cost us thirty or forty dollars to set up the outfit and, as to the treasurer, it hits him in a very tender spot. Clarence Blakeslee has said I am all right as Secretary but if you want my opinion, you have got the bummest treasurer in the city. Now, I want to put it to a vote and see if they want to stay here forty or fifty minutes to see the moving picture. It won't cost you a cent more, gentlemen.

(Voted.)

MR. SCOTT: Well, the chair is overruled again. I thought Mr. Kellogg might get sleepy. I will stay as long as he will. I might say in connection with these pictures that we are having them through the courtesy of one of our members, Mr. Charles E. Price, who is associated with the Portland Cement Association. He is a member of this society and it is through his efforts and courtesy that we have them.

Pictures shown and then meeting adjourned until 9:30 A. M. February 16, 1921, at Mason Laboratory.

* * * * *

WEDNESDAY MORNING

MR. BUCK: I think it is only fair that we elect the other three whose names are up. I think one of these men might feel hurt if he learned of it. He is a man from my own office; a splendid fellow. I think it is directly against the constitution to bring them up here but if you bring in one you ought to bring them all in. I so move.

MR. JACKSON: I second that motion. I think that the remarks of our ex-president, Mr. Buck, are right to the point. We should not make any discrimination.

MR. BUCK: I make my motion that the Secretary cast one ballot for these three others which have been up for admission to this Society.

(Unanimously voted.)

MR. SCOTT: (To Mr. Lynch) Now, this is just the kind of a man I like to talk to. Mr. Lynch has a peculiar job. He is on the program as engineer of amusement parks. I don't know how deeply he is going into the question of amusements. A further introduction of Mr. Lynch is unnecessary. (Alexander S. Lynch reads paper.)

MR. TURNER: Mr. President, I would like Mr. Lynch to explain how they handled the restaurant feature.

MR. LYNCH: The feeding of the people is not a difficult proposition. We provided, first of all, an outdoor grove with benches, making it known to the people to come and bring their lunches whenever they wished to do so. Then a lunch counter was put up and leased to outside parties but it was stipulated in the lease that at all times the prices would be under control of the management; in other words we didn't want them charging as much as twenty cents for a cup of coffee and twenty-five cents for a piece of pie. We absolutely controlled the prices of all things sold at the lunch counter and in addition to that we installed the restaurant, which was a high class restaurant where people could go and get just what they wanted; but in renting it out we have been rather unsuccessful in one of our parks. We didn't control the prices on that and the parties that had them put the prices so high on the foodstuffs that people preferred to bring their own lunch.

MR. PRESIDENT: The names of those who have just been elected by ballot are: (Reads names).

MR. SCOTT: If there is no further action necessary, those are the names of the newly elected members.

A member of the American Air Service Corporation read paper about aerial photography. Illustrated.

MR. FERRY: I would like to know about what the cost per acre is, covering wild territory, in that way.

A. A. S. C. Our price for the New York job is five hundred dollars per square mile. Six hundred and forty acres to the square mile will bring down the cost per acre. In some work the cost is not so high. We have done work for as low as fifty dollars per square mile, depending upon the amount of detail that is necessary.

MR. SCOTT: Gentlemen, the program, so far as the papers are concerned, seems to be completed with the exception of the paper which we have through the courtesy of the Secretary of the Interior, which covers the Alaskan Railroad. We can have that paper and it may be made a part of the record of this Society, if the Board of Direction see fit, next year. I personally saw the Secretary and asked for someone to come up here and tell us about the Alaskan Railroad. They had some very interesting problems in that territory. He would have come, but at this time of the year they were beginning operations and one interesting thing he told me was that their work from now on until the latter part of August is the most effective because there are no mosquitoes and that from then until the cold season the mosquitoes become very troublesome. I was very much surprised to hear that they were troubled like that in Alaska. The Secretary of the Interior mentioned a great many things that the department could do for a system of this kind, and if next year you find any project in which the Government has a hand, which would be of particular interest and would take it up early enough with the department, he would co-operate in every way possible to give us a very interesting discourse. They have some very capable people who are doing some very interesting things. I was much surprised to find out how much they were doing. With my associate, Judge Payne, who is now the Secretary of the Shipping Board, I have sat in his office and watched the wheels go around. I think, now, gentlemen, I have but one more duty to perform and before turning my office over to the new President, I want to say to the individual members and the Board of Direction that I very much appreciate the hearty co-operation I have had and I am also ashamed that I have sometimes failed to carry out the duties of the office; but it has been through stress of other duties and not neglect. The new president can be assured of my hearty support and now it is a great pleasure to turn over to him this office and all that goes with it.

(Mr. Jackson takes the chair.)

Mr. Jackson: I hope, fellow members, I shall have no more reason to feel ashamed at the end of my term of office than Captain Scott has at the end of his. At this time of our proceedings, as Mr. Scott told us, there is generally afforded an opportunity to bring up any miscellaneous business or to have any general discussion that the Society may see fit. Before doing that, however, I would like to make a couple of announcements and ask your advice on a couple of matters. I don't recall any announcement of the winner of the prize for the best paper.

Mr. Kellogg: I have not announced it because there have not been enough members of the Board of Direction together at one time to decide upon it. There will be no question in my mind but what it will go to Dr. McElwee.

Mr. Jackson: As I recall it, I think it was for members alone. However, it hasn't been decided yet. I would like to announce Mr. Clarence Blair, Assistant Secretary, and I assume this matter of getting this constitution straightened out is more or less important. Committee for this—Mr. Terry, Mr. Buck and Mr. Dunham. Now, gentlemen, I find in this constitution other things just as confusing as I have already brought up before this meeting. They are scattered all through the constitution. I would therefore suggest that a committee look these matters up and make a report so that there will be no question about it. I don't want to go ahead any faster than the Society wants to proceed without getting advice. I would like the following committees raised in order to work this next year but I don't know just how to do it except that I think they ought to be authorized by this Society at this meeting and from the floor. I would like a committee on membership, meetings, public relations and, finally, a committee on affiliated societies to operate this coming year. It may seem to you that we are going into the committee business pretty strong and I don't know if all these committees will be appointed, but I would like to have authority from the Society to appoint at least such committees as we feel we want to have and the only way to get that authority is to get it from the Society at this time. Of course, the President and Secretary are provided with large powers, but personally I don't want to assume any particular responsibility or powers without having the Society have an opportunity to discuss it. Will you discuss these matters in the short time we have and then anybody else can bring up something they want to.

Mr. Blakeslee: I move the President be empowered to appoint such committees as he enumerated.

(Seconded and carried.)

Adjourned.

PAPERS, TRANSACTIONS AND PROCEEDINGS FOR 1922

PRESIDENT'S ADDRESS

J. Frederick Jackson.

Custom prescribes that at the annual meeting the President shall give an account of his stewardship. Previous addresses, while following a certain form, display considerable diversity in their treatment of different subjects. Some review in detail the engineering work accomplished in the State during the year while others make a survey of engineering work in general. Since there have been no particularly large engineering works in the past year this report will confine itself to an account of the activities of the Society.

The Society did not publish a report for 1920, so a discussion in some detail of certain phases may not be out of place.

MEMBERSHIP.

This is the thirty-eighth annual meeting of the Society. It has grown from a membership of fifteen in 1884 to four hundred and eighty-three today. This growth in the main has been a steady one but there have been some noticeable peaks in the curve, such as in 1900-1919. But from 1919 on, the net increase in membership has averaged between five and fifteen. The segregation by classes is twenty-one honorary, four hundred and twenty-eight members, thirty-four associated. The geographical distribution shows that the larger proportion of the membership comes from three counties, New Haven, Hartford and Fairfield, and, naturally, the larger cities in these claim the greatest number of members. Each year the field for new members is supposed to be carefully gleaned, but inquiry shows that there still remain many eligible for some class of membership who do not belong to the Society.

As shown by the results of the past year, a membership committee with members from different parts of the State can be of great assistance in seeking out eligible prospects and getting their applications for membership.

FINANCES.

The general business depression is reflected in the finances of the Society, and in order to keep within our income it was decided to suspend publication of the proceedings for 1920. Even with this drastic action and the strictest economy exercised in our monthly meetings, we are not in any better condition than we were a year ago. A comparison of income and outgo for the normal year 1918-1919 and the year 1922 is attached.

RECEIPTS.

	1918-1919	1921-1922
Advertisements	$ [illegible]	$ 322.80
Dues	1,2[illegible]	1,433.34
		19.87
Total	$1,799.49	$1,776.01

DISBURSEMENTS.

Printing	$1,061.92	$1,546.84
Engraving	67.58	
Salary	200.00	400.00
Liberty Bonds	500.00	
Total	$1,829.50	$1,946.84

ASSETS.

Liberty Bonds	$385.00	$500.00
Cash	527.00	107.83
Total	$912.00	$607.83

LIABILITIES.

Printing	$0.00	$ 79.00
Notes Payable		439.15
Total		$518.15

MEETINGS.

The summer meeting of the Society was held at Double Beach and was largely attended and very successful. In addition, the Committee on Meetings organized monthly gatherings in different parts of the State. This policy was attended with some misgivings, the most sanguine hardly looking for an average attendance of over 25 and some doubting if the attendance would warrant carrying out the complete program. Meetings were held at New Haven, Waterbury, New London, Stamford and Hartford, and the average attendance was over 50 and the interest and enthusiasm manifested most encouraging.

LEGISLATION.

A full account of the legislation affecting the Society will be presented by that Committee.

One of the most important acts and one which was endorsed by the Society, namely, the licensing of engineers, failed to receive a favorable report in the Committee.

REVISION OF CONSTITUTION.

The Committee appointed to prepare amendments to the Constitution have worked faithfully and I think that all their recommendations should receive your serious consideration.

COMMITTEE ON PAPERS.

This committee in addition to providing the speakers for the annual meeting also collaborated with the Committee on Meetings in furnishing speakers for the monthly gatherings. The experience of the Committee proves the necessity of getting started early in arranging for a successful programme.

COMMITTEE ON PUBLICATIONS.

The Committee on Publications, due to the fact that the members lived in such widely separated localities, were not able to hold a meeting and conducted most of their work by correspondence. The Committee has given the matter considerable thought and I hope their recommendations will be discussed fully and some definite action taken by the Society.

COMMITTEE ON AFFILIATED SOCIETIES.

This Committee was not able to get together which was unfortunate, because, I believe that the question of affiliation between local engineering societies is one of the most important that we have. Arrangements for affiliation of the societies at Boston and New York have been practically completed. Upon invitation, I attended two meetings of the local Committee which is arranging for such an affiliation here and reported results to the Board of Direction with the recommendation that we accept the invitation to send delegates to a joint meeting to be held in March. This recommendation was adopted by the Board.

COMMITTEE ON PUBLIC AFFAIRS.

The Committee on Public Affairs were somewhat at a loss as to what they were supposed to do and some diversity of opinion existed among the different members as to just what the activities of such a committee should undertake. The arrangements for publicity for this meeting were placed in their hands and I think the results show that it was ably taken care of.

FUTURE WORK OF THE SOCIETY.

I believe that the policy inaugurated of holding monthly meetings should be continued and that serious effort should be made to publish our proceedings and papers promptly even if they have to be considerably condensed. It is not fair to ask men to present papers before the Society with the expectation that they will be printed within a reasonable time, restricting for ourselves the exclusive privilege of publishing and then defer their publication for two or three years. The Society suffers by this practice and it is unjust to those who go to the trouble of preparing and reading the papers.

We should affiliate with other local engineering societies to the fullest extent without jeopardizing the identity of our organization. I am convinced that from such joint meetings some good must come, if only in cementing chance acquaintanceships into strong friendships, and in getting some appreciation of what the other fellow is trying to accomplish. The engineer is too little consulted in relation to civic matters and this is largely his own fault. He is by nature and training diffident and lacks assertiveness. Citizens of much less mental caliber and inferior training and experience crowd him out of the foremost rank in organization for civic betterment. I believe that the standing of the engineer with the public would be very much improved if there were a better understanding between engineers engaged in different branches of the profession. It may, indeed, be rather late to regain lost ground, but let us, at least, endeavor to hold the ground we have and in any future advances see that the engineer takes his place in the front rank where he belongs.

Readjustments always hit the engineer hard. When curtailment takes place he is one of the first to go. The period of depression we are now experiencing has been no exception to this rule and affects all our members, some very seriously. There are indications, however, that better things are in sight and we earnestly hope that general business prosperity will resume so that we may all participate in its benefits.

To my fellow officers one and all, to the members and chairmen of the different committees, I wish to express my heartiest thanks for their coöperation and assistance, to the Society at large my sincere appreciation of its support during my term of office which has served only to strengthen and confirm my conviction that the members, both in personal and professional qualifications, are the equals if not the superiors of any similar organization.

THE MINING, REFINING AND USES OF NATIVE ASPHALTS*

By J. Strother Miller, Jr., Chief Chemist, Technical Department, The Barber Asphalt Paving Company.

The topic I have been requested to address you upon is such a broad one and enters upon so many diversified fields that I have through necessity limited myself to some extent in the subject chosen, and I will have to refer very briefly to the uses.

In the present day engineering profession we are too busy to acquaint ourselves with the details of all structural materials. The waterproofing work is assigned to one man or division, the roofing to another, paving to another, with the result that many firms consist of various engineers specializing in some one branch, and I will give you a brief outline of the Native Asphalt Industry—not however stressing any particular field of application. Each is a problem unto itself.

Asphalt as obtained in nature and requiring very little, if any, refining to make it suitable for use, has been of general interest for a great many years, and in more recent years for many different purposes.

Another class of so-called asphalts have appeared upon the market in recent years, which are produced in the petroleum oil industry, and for purposes of differentiation I use the term "Native Asphalt" as applied to the materials found as such in nature. Since there are two general sources of asphalt the question immediately arises as to how the native forms originated and what definition can we give of asphalt which would indicate the two classes?

More work has probably been done upon that type of native solid asphalt obtained from Trinidad Pitch Lake in the Island of Trinidad, and I would refer those who are specifically interested in this subject to a report by Mr. Clifford Richardson upon the general question of origin appearing originally in the Journal of the Society of Chemical Industry for January, 1898. Briefly summarized, this theory states that asphalt is in process of formation to-day. It does not originate as such but is a secondary product resulting from the transformation of suitable lighter forms of bitumen, malthas or even thinner oils, into harder bitumen by condensation and polymerization, a reaction in which sulphur and probably sulphates seem to take an important part. No high temperatures seem necessary once the change is initiated. Time is necessary.

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* Delivered, with illustrations, at the Chase Building, Waterbury.

Contrasted with this slow process of formation by which the native solid asphalt has probably been formed is the quicker process of manufacturing the oil asphalts. An asphaltic base oil is distilled in a closed cylindrical still, heated by fire and agitated by steam—the gasoline, napthas, burning oils, gas oils and lubricating oils are obtained as distillates and the residue in the still is controlled to give the best grade of oil asphalt obtainable from the particular crude oil under manipulation without economically sacrificing any of the more valuable distillates. The method of refining the native asphalts will be described later.

There have been many definitions proposed and adopted by various Governmental Bureaus and Technical Societies, but the one which seems to be the most inclusive and recognizing the two general classes of Asphalts is that of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, which reads:

> "ASPHALT:—Solid or semi-solid native bitumens, consisting of a mixture of hydrocarbons of complex structure, largely cyclic and bridge compounds together with a small proportion of their sulphur and nitrogen derivatives, but free from any appreciable amount of solid paraffines, melting upon the application of heat and evidently produced by nature from petroleums containing little or no solid paraffine. Solid or semi-solid residues produced from probably similar oils by artificial processes are sometimes called asphalts, but should properly be termed oil asphalts. The more common types of native asphalts are known by the locality in which they occur, such as Trinidad, Bermudez, Maracaibo, Cuban, California, etc. Native asphalts with few exceptions contain water, extraneous organic or vegetable matter and inorganic matter such as clay, sand, etc."

The two sources from which the largest amount of native asphalt has been produced are Trinidad and Bermudez Lakes. These two lakes are situated in South America; the Trinidad Lake on the western coast of the Island of Trinidad in the British West

Indies, and the Bermudez Lake on the eastern coast of Venezuela, about thirty miles inland by air line. The Gulf of Paris, about eighty five miles in width, separates the Island of Trinidad from Venezuela.

The Island is about 700 miles north of the Equator and about 2,000 miles south of New York City. Its area is about 1,700 square miles, or less than the area of the State of Delaware. The climate is tropical, but is favored by the trade winds which tend to ameliorate the tropical temperature, averaging as it does about 85°F. the year round, never varying more than twenty degrees. The only difference between the seasons is in the rainfall.

The Trinidad Lake (and "Lake" best describes it) is situated about one mile from the sea and 138 feet above sea level. It is about 114 acres in extent. Its surface is undulating, the mass of asphalt seemingly lying in large folds, and where these folds meet there is a crevice formed, varying in depth from a few inches to a few feet, in which rain water constantly stands, forming miniature canals. The mass is in imperceptible constant motion, which can only be detected by noting the relative position of the miniature canals at various times. This motion is also indicated by its behavior after digging.

The greatest depth of the lake has never been found. In 1895 a series of borings were made and the one at the center of the lake was carried to a depth of 135 feet, the entire depth being through solid asphalt of uniform character and composition, but the boring had to be abandoned as the tube or casing had been carried so far from the vertical (one foot in six) as to render any further boring valueless. The depth found, however, indicates an almost inexhaustible supply of this wonderfully uniform material, for while mining has been carried on continuously for over thirty-eight years, the level of the lake has dropped only six or eight feet in all that time. There is a perceptible rise in the center of the lake. The new material is either of the same character or replenishment must be very deep, or the borings would have indicated a change in character. The borings near the edge of the lake indicated considerable slope to the sides, and it is believed the Lake rests in a bowl-like depression, probably an extinct mud volcano.

There is a narrow gauge road running from the refinery and endless cableway, out over the lake, and, turning in a large semicircle so as to traverse as much of the Lake as possible, returns to the starting point. This road is not ballasted, yet there is very little sinking of the ties into the asphalt. A train consisting of several small flat cars, each car carrying a dumping bucket of about 500 pounds capacity, is pulled over this track by an endless cable running over the ties, and, by means of a portable clutch, a native sitting on the front of a train is able to start or stop the train at will. The natives dig the solid asphalt with broad mattocks and load the chunks into the cars by hand. The space left after a day's digging is completely filled within forty-eight hours, another proof of the continual motion of the mass. After loading, the cars are pulled either to the refinery or the terminus of an endless overhead cableway which carries the loaded buckets downhill and out over the dock to the steamer, the loaded buckets going down hill producing sufficient power to pull the empty buckets up.

The Crude Trinidad Asphalt, as it is called, is shipped in bulk in the holds of steamers, to all parts of the world, but during transit amalgamates into a solid mass and has to be dug out again.

We will now journey for a moment into the wilds of Venezuela to take a hasty glance at the Bermudez Lake. The only means of approach from the Gulf of Paria is by steamers up an uninhabited river known as the San Juan. For five hours we see nothing but mangrove swamps on either side of this wide and placid river, the only signs of life being the customs officials' hut at its mouth and myriads of multi-colored birds. The last five miles of the trip is up a tributary of the San Juan known as the Guanoco River. This really is a deep creek, it being so narrow that the steamers cannot turn, so they turn at the fork of the two rivers and back up to the dock at Guanoco in order to have a straight-away course when loaded. We take a narrow gauge road at Guanoco for a seven mile trip through jungle land. Indeed you cannot step off the ties of the road without going up to your ankles in water. All through this jungle you see the beautiful tropical flowers and birds of many colors, but never a note of song from the birds or a sweet scent from the flowers.

Bermudez Lake is about 2,000 acres in extent and varies from three to ten feet deep in those parts that have been worked. It is not quite as hard as the Trinidad Lake and the ties supporting the railroad have to be shifted frequently. There is considerably more water to contend with here as the seasons vary by one being wet and the other very wet. There is also considerable muddy silt to be mucked off the top, this mud being washed in by the heavy rains from the hills to the west. Owing to this mud you will find more vegetation on this lake than on the Trinidad Lake.

The asphalt is loaded by hand into dump cars which are pushed by natives in trains of three or four cars to an elevated track at the edge of the Lake, there to be dumped into wooden skips. These skips are hauled on flat cars seven miles to the steamer's side at Guanoco, lifted by the steamer's winches and dumped into the hold. The Bermudez Crude runs together while in transit, the same as the Trinidad.

As the operation of refining is the same for both asphalts, we will describe more fully the Trinidad.

As obtained crude, the Trinidad contains approximately and uniformly through all cargoes, 39 per cent. of bitumen, or that portion that is soluble in carbon disulphide, the accepted solvent of the asphalt industry for determining bitumen, 32 per cent. of mineral and other matter, and 29 per cent. of water. For comparison, Bermudez Crude varies as to its water content averaging about 25 per cent., 1 to 3 per cent. of mineral matter and 68 to 72 per cent. of bitumen. The refining in either case consists in driving off the water in a steam heated still open at the top, at a temperature of about 350°F. It takes about eight hours to refine a still of fifty to seventy tons. It is then either drawn off into slack barrels, such as cement is shipped in, surface cooled by water to prevent splashing while being hauled about the refinery yard and shipped direct to customers or it is fluxed before drawing.

Fluxing of a refined asphalt consists in adding a predetermined quantity of a petroleum residuum, or flux, which flux is bought under stringent specifications assuring a uniform material suitable for paving and other purposes. Refined asphalts have a consistency or penetration of from about two for Trinidad to twenty for Bermudez. This consistency is determined by means of a sewing needle of certain size and make, under a fixed load acting for a fixed time at a standard temperature and a degree of penetration is ten times the number of millimeters the needle sinks into the asphalt. The refined is too hard for use in paving operations. The proper consistency is dependent upon climatic and traffic conditions as well as the grading of the mineral aggregate with which it is mixed to produce a paving mixture. The fluxed asphalt must not be too hard in cold weather and yet not too soft in summer. You have all noticed, and I presume heard, unfavorable comments upon the softness of some sheet asphalt pavements in the summer time. Did you ever see a sheet asphalt pavement with heel marks, horses' calk marks or tire tracks in it in winter? What becomes of them? They iron out, and a pavement that does not mark a reasonable amount in summer must be viewed with suspicion. It will probably be too hard in winter. This is one feature that technical control has been and will be of much assistance to the paving industry.

When the refined is fluxed it is called an asphalt cement as it is used to cement particles of mineral matter together, and after a still has been fluxed to proper penetration or consistency, it is shipped in either single or double head hardwood barrels, according to its consistency, and is ready for use when received, except that it has to be remelted. Some customers prefer to flux the refined themselves; others desire it ready fluxed and, for country road purposes it is shipped ready fluxed in the majority of cases.

Asphalts have been applied to many different uses in the past few years; and the simple fluxing to varying degrees of consistencies referred to above does not adequately describe conditions to-day. Some uses require the softest, while another use requires the same melting point but a much harder consistency. Such variations are obtained by proper blending of two or more asphalts or the incorporation of materials other than asphalts.

Obviously the type of material suitable for use in hard rubber compounds would not be suitable for saturating canvas to produce a waterproof and mildew-proof piece of goods. Neither of these products would be applicable for building tank linings to withstand temperatures up to 120°F., and mixed acids such as sulphuric and nitric of about 25 per cent. strength, such as is met in the dye industry.

The most familiar use of asphalt, to the general public, is in highway construction—yet probably a larger combined tonnage of various types of bituminous materials is consumed in the roofing industry. The so-called "ready roofings" are aptly called "ready" since all the trimmings are packed in the roll and all one needs to lay this roofing is a knife and a hammer. Then we have the slate surfaced roll goods and shingles, which have a naturally colored granulated slate embedded on one face so that very attractive red and green color effects can be obtained. Another type of more expensive construction and not so ready, in that a certain amount of skill and equipment are necessary for proper application, are the built-up types where several thicknesses of asphalt saturated felt are plied together on the roof with hot moppings between each ply and over the entire surface of the finished roof.

With the advent of our modern skyscrapers and sub-surface structures—such as subways, the question of waterproofing has become more acute than when we were dealing with surface structures only, and asphalt is being used extensively in this field. Briefly, we have three general forms of application. First, merely a hot mopping of asphalt where only dampness or surface water is met with. Second, membrane systems where hydrostatic pressures are encountered and, third, the application of bituminous mastic, a mixture consisting of asphalt, mineral dust as filler and a sand gravel aggregate mixed in varying proportions, dependent upon local conditions. The waterproofing of reservoirs and swimming pools should also be mentioned.

In certain types of rubber compounds specially prepared asphaltic compounds are used, not as an adulterant but because they add certain properties to the finished article. This field is a broad one and carries us to the rubber-covered insulated wires, submarine cables, battery boxes, hard rubber and mechanical goods of all kinds.

Molded articles of various kinds depend upon asphalt as a binder. Brake band linings on your automobiles depend upon asphalt of one kind or another for the waterproofness and lack of slipperiness.

In these days of conservation the culm banks of the anthracite coal regions are yielding their wealth through the fuel briquette bound together with asphalt.

The chemical industry had a problem in providing acid-proof tank linings and floors that has been solved by acid-proof asphalt mastic. For tank linings where temperatures of solutions are not up to 210°F. but moderately concentrated acids are used; these acid-proof tank linings, with or without expanded metal reinforcements, have proven up in service. In one plant situated so far from centers of production that transportation charges on lead lined pipe or terra cotta pipe was prohibitive, acid proof mastic was shipped to the plant and local mineral aggregate used to construct reinforced acid-proof mastic pipe up to fifteen inches in diameter. Fittings, diaphragm check valves, strainers and many specialties were made so that entire pipe lines of mastic were possible and successfully operated.

Asphalt mastic floors are finding broader application every year, whether acid conditions have to be met or not. There seems to be a certain amount of resilience to such floors over the unyielding, hard, dusty, concrete floors that many mills are installing them with an increase in efficiency of operators immediately noticeable. One situation in particular occurred in the loom room of a mill. The female operators lost considerable time complaining of aching joints—ankles and knees. A trial section of mastic laid in front of a few looms completely eliminated this unusual lost time.

Protection of steel tanks buried in the ground has been furnished by the use of an asphalt enamel applied hot after priming the surface with an asphalt primer paint applied cold. This same form of protection has been used successfully on oil pipe lines where such lines are alternately on the surface or below ground surface. The Panama lock gates are, I believe, protected with this same type of material. Steel vessels, and especially those of our Navy, have their bilges and interior steel surfaces in inaccessible places coated in this manner. Coal bunkers, drinking water tanks, anchor chain storage rooms, etc., receive a similar protective coating.

Spiral riveted pipe and other forms of sheet metal pipes are dipped in specially constructed dipping tanks containing hot molten asphalt. The pipe remains in the bath until it assumes the temperature of the bath and when withdrawn the asphalt drains and sets quickly to a smooth, even coating of considerable thickness which is tough, elastic and fairly non-brittle in cold weather.

Many black paints, varnishes and baking japans contain asphalt of one kind or another, applicable to many purposes, and fulfilling the requirements admirably where such classes of materials are adaptable.

Probably every reader of a daily newspaper handles asphalt daily and does not know it—yet it is a fact many newspaper inks have asphalt in the vehicle which binds the carbon black. Your Sunday Supplement, with the beautiful sepia tones, known as the photogravure process, depends upon asphalt for its colors. Certain wood stains are also made in a similar manner and some of the Circassian Walnut effects might depend more upon the grain of the wood and the stain used than upon the wood of the walnut tree.

Case linings and bale wrappers of duplexed paper, either plain or crinkled, are providing moisture proof packages. Paper cartons are even lined with a silicated paper fastened to the paper board of the carton by asphalt. Indeed asphalt has been tried and will no doubt some day be used in place of glue or silicate of soda as an adhesive in making paper tubes and cartons.

Caulking pitches for joints in wooden decks consume their quota of asphalt. Boiler settings are being coated with a fibrous plastic applied cold to prevent infiltration of air to the fire box or hot gas compartments beneath the boiler. Parts of shoes are stiffened and other parts waterproofed with asphalt, and the storage battery in your automobile is sealed with asphalt and probably painted with an acid proof asphalt paint.

Do not get the impression that all of these adaptations are dependent wholly upon native asphalts, but I wanted to give you a brief outline of the present day uses of asphalt in general.

EVOLUTION OF THE TELEPHONE INDUSTRY

By Frederick Stevens.

Mr. President and Gentlemen:

I am afraid that I can not live up to the standard which Mr. Jackson has been good enough to give me. When, due to the fact that he had not seen me for a number of years, he was good enough to ask me to come up here and talk to your organization this afternoon, I hesitated a good deal about accepting the invitation, feeling that your Society would be surprised by the receipt of a number of technical papers which I did not feel competent to prepare, and I was therefore very much inclined to decline the invitation. On thinking the thing over however I came to the conclusion that we were all interested in very much the same thing. We are all engaged, either directly or indirectly in some form of public service. Appreciating as I did from my own work the advantages of learning about the other fellow's job, and finding when we co-ordinate that we can be of assistance one with another, I felt it was worth while. I want to make it just as informal as I can.

First of all I want to supplement what Mr. Jackson has said. I shall be very glad if anyone would ask me to explain anything as I go along. I do not know, of course, what may be important to you, or what you would like to have perhaps more in detail than I may give it. In what I want to say to you therefore I am going to try to talk as one workman engaged on a public service job to the rest of the people who are all engaged more or less with the same sort of a proposition, and who are trying to furnish services of some sort to the public, and trying to do the best job that we can.

If I do not tire you before that time I want to take a minute and just give you the result of my experience as an operating man and refer to some of the points in regard to which I think engineers may be able to do a better job. That may sound presumptuous but I am going to take a chance upon it.

In the matter of public relations, or in the matter of public service as we generally know it, I would like for a moment to talk about the Telephone Company, and to tell you something briefly about its organization and its history, as possibly I know more about that than the other phases of the public service business, and also because in its own organization the telephone industry probably covers more romance of engineering activity and comes into contact with more different phases of public service, and has corporations engaged in public service. The telephone industry occupies a more or less unique position in that it is one of the very few, if not the only one, which has to be treated as a complete national organization and when I speak of the telephone industry I am, of course, referring more particularly to the American Telephone & Telegraph Company with which I am connected. Practically any other organization can be divided territorially or functionally into separate divisions, and while they may have more or less close relations with each other in the different parts they have not, of necessity, to be regarded as one complete single organization, operating throughout the entire United States at the same time. It has got another element in it, although, to a certain extent, it corresponds to the gas and electric light companies or water companies, and that is that the time that its services are demanded by the public, or the particular point at which the public wishes to make use of its services, is something which is entirely out of the hands of the company and entirely in the hands of the users of the service. That is an element which applies more particularly to the telephone service than to most any other public service corporation.

The telephone company has also another element about it, and which is rather a remarkable fact in itself, and that is it has followed along exactly the same lines in building its organization, and carrying out its method of business as was outlined in the early stage of the business some forty years ago. Perhaps some of you gentlemen here can go back in your memories as far as that. I was in college and I can readily appreciate that in that time I have turned over quite a number of the pages in the life of a graduate, but after all it does not seem so very long ago. When you stop to think about it however that when the first experiments were being made and the steps being carried on to develop long distance telephoning, comparing that with present day conditions shows what a long way we have travelled. Back at the beginning of that period was when, I think, the first long distance service was put on, largely for experimental purposes, between Boston and New York. That was the first attempt to make what was then known as long distance connections. But I must not ramble over these allusions. One of the other elements about the telephone business which I could never get away from in the number of years that I have been in the business, and I think possibly to those of you who are engaged in the engineering work and even to the general public, for there must be a certain amount of consciousness or romance which is connected with our business that makes it, particularly to those of us who are in it, very fascinating and attractive. I say the romance of it. It is within the last thirty-five or forty years that the entire telephone business of this company has been developed, and plans that we made for the development of the business, or which we outlined thirty-five or forty years ago, have been, in the main, substantially followed out, plans which provided for the development of the industry throughout the entire United States. And when we stop to think that at the time that these plans were originally made and outlined, it was practically impossible to talk across the street even, I think you will appreciate that it is rather interesting, in this connection, to call attention to the closing paragraph of the charter of the American Telephone & Telegraph Company which was organized in 1895 and when they were still experimenting whether you could talk between New York and Boston. After reciting the intention of the company to build toll line regular routes, routes which now form the main trunk lines, that charter winds up with this rather remarkable statement, for certainly it was a remarkable statement for that period: "And communicate by means of wire or cable or means hereafter discovered, with all parts of the known world." The man who drafted that certainly must have had a vision of the future, and the remarkable fact about it is that we are now approaching it. A little later on, if I have not tired you people out, I will tell you what we have done along this line. We are, in very fact, fast approaching the time when we shall be able to communicate with "all parts of the known world." It is quite interesting, it seems to me, to see also the men who outlined that proposition in the early days. There are a few of them like Dr. Bell still living. A few of them like Mr. Vail and Mr. Howell, and two of your own Connecticut men, Mr. Tyler and

Mr. Doolittle, took prominent parts in outlining the development in those early days, and most of them lived long enough to see practically all of their visions carried out. A most remarkable group of far-seeing men. And so I say that those who have been in the business, connected with it, and who have been in it for a number of years cannot get away from the romance of the business, nor can we cease to speculate what the future has in store for us. The other night in New York we had the head of all of the Boys Schools in the eastern part of the country in, and in talking that over Dr. Stewart brought out a rather striking thought illustrating the possible production or development for the future. We concede, he said, that we must demonstrate the available service of our lines from Philadelphia to San Francisco. In that connection we utilized a little bell which hadn't been sounded for about seventy or eighty years, but by means of a telephone operator and the transcontinental line that bell was again sounded and was heard in San Francisco. In connection with that illustration the question was raised as to whether the next time that bell was sounded it would be by means of further development in the wire system or by wireless telephony, and whether the tones of that bell would be heard all over the world. Well, this is not the time to picture what the future may be with respect to the possible development of the telephone system. The rise however, and development of the business has been so rapid and extensive that I think you will all appreciate what I mean when I refer to it as the romance of the business. We can all remember a few years ago when the question in our minds was: "Can we reach this city or that part of the country or that territory by telephone." That day has gone by. The question we ask today is whether by means of the wire system or by radio broadcasting, there is anybody in the United States who can possibly escape. And that also is not as vain or optimistic a statement as it may sound, because it is a practical proposition to-day that one standing in this room can lift his voice and be heard by practically every inhabitant in the United States.

Let me go back for a moment to the organization. Possibly it may interest you people a little as to how we undertake to do our job. In the last analysis the job of the telephone company can be put in a few words. It is our job to decide means by which any person in the United States can communicate orally with any other person in the United States. That sounds comparatively simple, but when you stop to think that it is a job which is putting a great many of us in an early grave in trying to carry out the business as a whole, and in taking care of what is known as the Bell system, will appreciate that there is another side to it. If I get started in talking to you about things which you people do not like to hear I wish that you would stop me. It is a little difficult for me to discriminate or to know exactly what you would rather hear about so I will appreciate it if you will stop me in case I take the wrong tack.

The Bell system as it is known, or the American Telephone & Telegraph Company, is the successor of the American & Bell, the original company which was the parent of the old Company which commenced to operate by attempting to furnish services between different points. The local service, of course as you know, has always been taken care of by long wave units, such as you have in your Southern New England Company which operates here. The Western Electric, which is a newer company, supplies the different parts of the United States with apparatus and the Company which I represent takes care of the long distance department and furnishes long distance service which connects territory such as that of the Southern New England territory along outside. So that the territory of the long distance company is not held by the typographical boundaries of the United States. It covers the entire area of the United States. In doing that we have built up our lines as main trunk lines running throughout the country, without attempting to reach all communities, but reaching them through local exchanges, and to a certain extent through local Bell lines, thus making the main trunk line organization an organization competent to handle more capital through business only. It has developed into quite an organization. When we started we had in the entire long distance plant in the United States only two main lines. In other words the entire long distance plant of the United States was limited to two lines, one between New York and Boston and one line from New York to Buffalo. Later there was another line between Chicago and St. Louis and a line from New York to Washington. Today the long lines of the system cover over 28,000 miles, and a large proportion of the new lines, as well as the old Bell lines, are under ground and represent a plant investment of over $100,000,000. Where the end is going to be I don't know. We have built up a system whereby most anybody can communicate with most anybody else. Surely we are approaching the time when we shall be able to communicate with all parts of the world.

I am going to digress here for just a minute. I want to refer to something which will perhaps be of interest to you more particularly as engineers. As I gather it, you people are interested in municipal work, in road building, in highway work and work like that. I have just referred to our underground proposition. Those of you who are connected with public utilities in Connecticut, or with highway commissions, or with your city organizations are engaged to some extent in work in which you come in contact with a part of the Bell system represented by the Southern New England Telephone Company. You are all interested, I take it, in that phase of engineering which may have to do with the construction of telephone lines on these highways. But there is a phase of that that I want to call attention to, and that is the establishment of the underground system providing for telephone service. Possibly some of you people in going over the highways of Connecticut have seen these little concrete monuments along some of the main highways when you are along the shore roads and between here and New York and also on the old Hartford turnpike and in Hartford. Possibly some of you have wondered what they were, whether there was some Indian buried under them. As a matter of fact those little monuments show the location of our main trunk subway between New York and Boston. They are put there so we can help you people in your road propositions by not disturbing your roads any more than is absolutely necessary. The rapid development of improved highways, not only on state highways but in city streets and particularly the installation of many concrete highways has forced us into a position where we have had to build our underground lines materially in advance of our own telephone requirements in order not to tear up permanent highways. These little monuments help to identify the location of our lines. There is no trouble to locate them. All we have to do, under normal circumstances, is to take the iron cover off the manhole. Now I take it you are interested in that type of construction and there are several ways in which you can help us. You can help us by giving us such advance information as is within your power to give, as to when you are going to permanently improve your highways and give us an opportunity to do our work in advance of your work. That at times is a very serious proposition and our failure to work in close coöperation with the engineers on construction jobs of that character sometimes results in much needless expense. I have in mind a case in the northeastern part of Connecticut where a state highway ran, where we were given an established grade and built our subway—and subways cost money—and we didn't any more than complete the subway before the plans for that highway were changed and for about a mile and a half we had to go through anywhere from eight to fourteen feet of solid rock and lower that whole subway. In the meantime we had to keep our cables working. You can see what a trouble it was. Now a little more of coöperation and your knowing a little more about our job would have perhaps saved the expenditure of that money and been very helpful to all of us.

There is another side of that underground work which may be of interest to you people, and which also has a bearing on this question of tearing up your improved highways and city streets. A telephone subway constructed must be constructed for a certain number of years in advance. We have got one limitation which has been maintained for many years, and that is the interior size of the duct. That is the limit I think, or the inside diameter is two and five-eighths inches. I cannot tear up a street without injuring the subway. Now we are having every day and from month to month increased demands made upon us for the use of these subways. I think some of you know how well we try to meet those demands. We started in with four cables, which carry so many pair of wires. We finally got up to 300, to 600, to 900 and to-day there are in common use cables carrying 1200 pairs or 2400 wires. We are endeavoring to save our steps by making our construction better and larger but it has got to such a point to-day that we are jumping intermediate stretches and trying to increase the size of the cable to carry more wires in it. We are now working on a proposition of taking a 1200 cable and increasing that up 25% That is where we are all interested in the development of the highways. We, of course, do not wish to dig up the surface of improved highways any more than is absolutely necessary. That shows you, I think, where we can both help each other by working closer together to avoid the destruction of public property by tearing up public highways.

The organization born of long distance telephone service throughout the country is a straight functional organization. I was glad that Mr. Jackson referred to the crew proposition, because to me that has always meen a most helpful one. About ten or fifteen years ago when we had our old form of organization I spent about two years in studying methods of organization and these studies embraced about everything from the organization of the Yale crew to the organization of the Catholic church. We finally decided on a straight functional organization for the concern. The long lines, or the divisions, did not come together at all until they came together in my office. These several departments of trunk, plant and engineering, each one headed by a proper officer, came in my office. The heads of these several departments report directly to me. As I said to you before, we are operating through the exchanges. That is the business comes to us through the local office when you call for "toll line." All of that work is done through the medium of the local operating units, like the Southern New England which covers most of the main principal points, and these are important junction points of the through line system. I don't know as you people are so much interested in the method of our organization, or not so much in our scientific department, but I take it, you people are more particularly working engineers and are interested more particularly in engineering problems. But in order to carry on the construction and operation of our lines, covering the entire territory of the United States and now in certain places existing out of it, we have had, of course, to build that organization up through development.

We have had in the last two or three years one or two instances which afforded very spectacular demonstrations of what it means to us in the matter of organization. I have seen one this year in the extension of our line from Key West to Havana. That involved the construction under the ocean of a line extending about one hundred miles. The job involved the long submerged cable, and it involved the development, installation and successful working of an entirely new type of cable, or a cable which was designed not only to stand for the type of water strain and conditions to which it might be subjected from being submerged in the mud, but a cable whereby we could get as perfect transmission as possible. I am not going to tell you the details of how those cables are constructed because that would obviously take more time than your program will permit, but I am simply going to say to you they were a single wire. There are three of them and we are able to get three telephone conversations, and at the same time to operate nine or ten Morse wires simultaneously with the telephone conversations. The interesting fact of that, or in connection with that, is in line with the development of radio or wireless telephony. At first blush it would seem that if there ever was a place where such an idea should be applied it was between Key West and Havana. But a very careful study of that situation convinced our people that not only was there a better service to be had, the secrecy of the service better maintained, and a larger volume of service, and a better preservation or continuity of service, and a more economical service, by the construction of the cable than by the adoption of the other idea. We found that we could put in the cable cheaper in that way and could give a better service and give it cheaper by cable than we could by wireless. Taking the other side of it, there have been one or two situations which arose where we have made use of the radio telephone service, particularly between us and the Catalina Islands. During the War period submarine cables could not be manufactured in this country, nor could we obtain them from England and the exigencies of the situation made it necessary that we put in wireless at that point. I may dwell perhaps for a moment or two on that matter because I would like to get clear in your minds the relation of the radio telephone to the wire system. At the time we opened that service to Cuba we established a circuit from Havana clear through to the Catalina Islands, making a total circuit of about 5,600 miles, made up of 110 miles of submerged cable, 40 miles of wireless telephone appliances coming up from Key West along the Atlantic Coast, and then straight west down to the Pacific, to Los Angeles. It developed some rather interesting features at that demonstration. The demonstration was held in the Pan-American Building in Washington. The line was opened by the President. Most of the representatives of the South American countries were there. Representatives of the Pan-American Union were present on that occasion. It was rather of an interesting thing to them to point out to them that the distance which we were able to cover would permit representatives of quite a number of the South American countries to sit in that building at Washington and talk with the capitol of his own country no matter where located in South America. That was pointing out to those people a new field, and of course tended strongly to bring home to them a real appreciation of the extent to which telephone service has been developed. It was interesting to some of the English that the distance covered would take them from London to Mexico, and even down to Cape Town. So when I say that we do not know the limit to which telephone development may extend, those examples I think will show you how far we have gone to-day. I hesitate to predict the extent to which development may go in the future.

To come back for a few moments to the transcontinental line which was opened about nine or ten years ago, that involved a question of entirely new development in that we had never attempted before to talk that distance. In working out that line it was constructed entirely upon principles which we believed would be successful when applied to distances of that character. Prior to the construction of that line, or during the first stages, while the line was being built it was equipped with headcoils. To-day we have not on those lines a single one of those. We have taken them off and substituted what we call telephone repeaters and which give us very much better service, so that to-day it is practical to talk from New York to San Francisco with the same accuracy of service as between New Haven and New York or New York and Philadelphia.

And what is known as the comparative advantages of the wireless method to the wire system. There has been some newspaper talk about that, and a good deal has been said about the possibilities of that sort of thing. Some glowing prospects have been held out as to how it can be applied, but do not be led away. It is like a great many things in the telephone way. It is not immediately applicable to local Bell service. There will be no economy to-day in the State of Connecticut to try to utilize that method. There are certain types of it which can be used between New York and Boston. But it is only as a through proposition. It is not yet adapted for local work. So while we are not prepared to say that the development may not come into the local work some day, that time has not yet come to hand. With a single pair of wires we used to get but one telephone conversation. To-day it is perfectly possible to get four. Where we were before operating a single telegraph wire on top it is now possible to get one or two telephone circuits additional, with anywhere from eight to twelve or fourteen wires all working simultaneously and without interference with the same pair of wires. But it takes an enormous amount of apparatus which is very complicated and expensive and it means that on long distance lines your cost of construction runs into a very large volume. Where we are going and how far we are going I do not know. I know we are working on it to-day, but what the result of the study of the problem is going to be no man can yet say. To-day we are giving the highest grade of telephone service that it is possible to give of any type, and it is perfectly possible with a single wire or a pair, with the necessary apparatus for duplex or multiplex service, to increase capacity. We are going to furnish to the public the best service that we can.

To revert again to the underground proposition. I referred to that a while ago. The advance or the development which has taken place in regard to our underground conduits for long distance work has been substantial. There are means where by our cable underground proposition, by increasing the number of wires in a cable, and by diminishing the size of a wire on top of the small sized wires, we may be able to get instead of one circuit three, four or five and maybe a dozen with the same pair of wires.

I may be unduly optimistic from the point of view of an operating man. I may be making a wild statement. I don't think so however. The question which is most popular to-day is the question of radio telephony and particularly that feature of radio telephony which is known as broad-casting. I don't know of anything which has so struck the popular fancy or has become popular as an indoor sport to such an extent as the matter of broad-casting by radial telephone service. Where it is going and what its final answer is I am frank to admit I do not know. I will say this however, that we are going to find out. I am going to have, and will probably have in operation within the next month or six weeks, a broad-casting station on top of our building in New York city. We are going to give the matter an exhaustive study. We are going at the proposition to find out whether there is a commercial field in it or a commercial demand for radio telephone broad-casting. If there is we are going to be in a position to offer it to the public. If the public want a broad-casting service we are going to try to be in a position to furnish it.

If any one of you gentlemen, for example, have an idea that you would like to do some broad-casting, and you will come to me and say that you would like to do some broad-casting from seven o'clock until seven-fifteen, I would probably ask you, in a general way, what you were going to broad-cast? Of course I would like to say that you must keep within the police regulations, but outside of that, provided you are responsible or provided you represent a reputable concern and want to broad-cast something that is more or less respectable, my answer to you would be: "Here is the broad-casting station. It will be available to you from 7 o'clock until 7:15 at a price. Go to it." Whether our investigations will show that there is going to be a demand for that sort of service, of course cannot be answered at this time. I do not know what is going to be developed out of that, or what the demands are going to be for that type of service.

It is curious to note the general demand in some way, and the almost wild demands for that proposition. I suspect a good deal of it is newspaper work. I am frank to say that we are on our way to find out what there is to it. It is a new thing and what has been said or written about it has created a popular impression that radio broad-casting is bound to be a commercial success. Whether it is will depend upon the demand. It is going to be however, a very difficult thing to get into people's minds, when they look in the air and see the extent of the ether, that really, as a matter of fact, the possibilities of the use of the ether for radio work, either telephone or broad-casting, are extremely limited. It is just like the highways. You can get so many automobiles on them. In the ether you can get just so many wireless waves out of it, and it is very limited. So we are going to run up against the proposition of the matter of wave lengths, and the use by people of the common wave length, the ordinary ether wave and lengths that are reasonable, widely separated. To state the matter more concretely, so far as our present studies have gone, the limitation as to the extent to which wireless can enter as a commercial proposition appear to be limited. That is going to be, to a great many people, a distinct jar, because they have apparently entertained the idea that because the air they breathe is free there is no limit to it. They see radio telephone messages cast into the air and received at distant points, and cannot understand why anybody cannot do it without interference with anybody else.

The waves spread out so they come in conflict, not only with individuals, but with governmental messages; and it will undoubtedly give rise and occasion very elaborate international regulations. As I stated before, we are going to study this entire matter and we are going to try and find out what is the value of radio telephony. What is going to be its effect on the wire system? At the present time the best answer that we can give to that is this: that there is no question in certain fields as to the applicability of radio telephony. There is no doubt that there is a distinct field for radial telephone service. This distinct field is between fixed points. Between ships, between ships along shore, the earth and aeroplanes, across long expanses of water or across desert sections. Not, however, as an individual item but as a matter supplementing the service furnished by the wire system. In general then, as we stand to-day, all that we can say about it is from what we can see ahead of us or so far as we are able to determine, a radio system or the wireless system, when it comes into popular or commercial use, will be largely supplemental to the wire system. That is our best picture of the thing to-day.

Perhaps I have told you enough now about the telephone, unless someone would like to ask me about some of the details of it. If there are any questions and they are not too technical I will try and answer them.

I would like to say a word further, before closing, to the engineers here. I would say that from my experience as an operating executive that this thought has occurred to me. Is the engineer to-day giving the real value of his work either to his organization, his employer, or the public, and is he putting himself in a position for his own best interest and best advantage? Now that may sound like a somewhat complicated question. I don't think it is. What I mean is this: It has two sides to it. This is what is going through my mind. It applies so far as the engineer himself is concerned, his value to his organization, and his value to the public, and it is emphasized by the high degree of specialization now in vogue. In any big organization to-day and especially on any large engineering project the tendency is to develop a high degree of specialization for the engineering man. That, however, does generally prevail. I have thought that the tendency is too strongly towards specialization. It is a mistake for a man with engineering training to put himself mentally in about the same position as some men are in in Ford's factory. An engineer should not, in my judgment, place himself in a position where he is going to be put in a rut or groove. The question therefore is, is the engineer by sticking absolutely and entirely to his own specialty, doing something for his advantage or is it detrimental to his breadth of view? Is he by so doing getting a picture of the relation of his work to the other parts of the organization or the relation of his work to the public? Is he doing that or is he just getting into a narrow groove so that he knows nothing of the work that is going on about him in connection with his employer, or with his organization, except that particular field which he is following, so that he does not know whether he is making an automobile, a submarine or an aeroplane, and what is more, does not care? I don't believe that we have reached that point to-day, but what I do want to impress upon you and upon all engineering people that we come in contact with, and particularly as we come in contact with engineering successes, and with the graduates from other fields, the importance of the idea of learning the other branches of the business and to get them away from the idea of specialization absolutely and exclusively, on some one particular phase and to lose sight of that phase for the benefit of the rest of the organization. If you don't get away from that you will lose real value yourself to your organization, and you are losing your value to the public in representing your organization. In such case, particularly with you people who represent municipal departments, you are losing your real value to the public as a representative because it is forcing you to talk in a language which is perfectly intelligible to yourselves or to one who has specialized as you have, but it is not intelligible to the average man or to members of the public you come in contact with.

Along that same line let us keep this in mind. Those who have had the advantages of education should learn to talk the other fellow's language, and not take the position that the other fellow should learn to talk our language. The man who is really doing the work should learn to talk so the other man with whom he comes in contact can understand. Let me illustrate by a little personal experience what I mean. I probably have as highly technical organization as it is possible to have, different departments, that they needn't waste their time writing me letters; that if they couldn't come into my office, and in ten or fifteen minutes tell me all that it was necessary for me to understand or necessary for me to know, in a language which I could understand, then they didn't know their jobs. That may sound rather cold-blooded but it is perfectly true and it is applicable to any organization. If a man knows the business side of his job he ought to be able to tell it to you in words plain enough and short enough so you can understand exactly what is meant. Within the past year I have made certain changes in the personnel of my organization, the relation of which may, in the first place, sound to some business men as being crazy. In one instance I had occasion to appoint a new commercial manager. I did not take a man out of the commercial department. I didn't go to one man in the commercial department but I took a man from another department altogether. I took my engineer. I took a man who was a graduate of a technical school, a trained electrical engineer and a man who had spent some time as an operating man. I took him out of that job and made him general commercial manager. I am perfectly willing to admit that my boss thought I was crazy in so doing. He not only thought so but he told me so. I was insistent about it however and he finally said that it was my funeral, and he said go ahead. I wanted a man with an engineer's training. I could judge the needs of the business and the type of man necessary for development along the telephone lines in the country, and they were willing to pay for him. The experiment has proven a success. It has been a benefit not only to that department but to the man himself. We do not want always men whose training has put them in a groove. The company cannot stay in business unless it sells its wire at a profit any more than a grocery man sells his stock except at a profit.

This week I had occasion to appoint an auditor, the previous auditor having gone up to Assistant Comptroller of the American Company. The man that was appointed was a graduate of a western university, and he had become a mining engineer. His tendency has been toward mining. His training, nevertheless, has been such as to give him the ability, had given him a business education which I believe would be of high value in the accounting side of business. So it runs right straight through our departments.

There are, with very few exceptions, men to-day occupying positions of the highest supervisory character who have had engineering training, and very few of them have stuck to that particular side, but from their general knowledge of the business they have been able to much better advance themselves, and to apply the training which they have received along that line to the general business and at the same time have been very much more useful to the company and to the public. They have not stuck to their narrow specialty. By not doing so they have broadened out and their value, as I have suggested, has thereby been made not only greater to themselves but to the organization and to the public. That is what I mean by saying that it was not only for the advantage of the public or the municipality but also to the state or nation.

They are interested not only in what we are going to do, how we are going to do it, but what it is going to cost.

THE ENGINEER AND THE LAWYER

By Hon. Robert L. Luce, of New York City.

A lawyer is, by definition, one versed in the laws.

The definition of an engineer is less simple. A word is often an ideograph. But the idea is usually kaleidoscopic. Time varies the meaning. The form of the word is less mobile than the meaning, yet both shift like a screen picture. What is an engineer? An appeal to the court of last resort in the realm of language, aforetime presided over by Noah Webster, now by his successors, those engineers of lexicography, Funk & Wagnalls, resulted as follows:

The meaning of engine as an apparatus for producing some mechanical effect is highly derivative. Its primary signification brings us nearer our objective. In correct usage to-day, the primary definition of engine is: "Innate or natural ability." Its synonym is the derivative: Ingenuity. An engineer, basically, is one possessed of ingenuity. The word is of classic lineage: By Genius out of Ingenium. Genius: one who has an exalted mental power distinguished by instinctive aptitude. Ingenium: the product of genius,—an invention. Thus we progress to the modern conception which warrants the definition of Engineer as the collective term for all practical geniuses. Engineering is the specialized knowledge of the laws of Nature and its useful application. Three hundred years ago, Sir Francis Bacon could summarize all learning in two volumes. To-day a five foot book shelf might accommodate the stored wisdom of a single branch of Engineering.

However endlessly diversified Nature's manifestations may be, some Moses arises to reveal the laws of each Science. The Research Engineer interprets and transcribes the immutable laws obeyed by Nature's forces. As each manifestation of the unknown is interpreted and formulated, a new branch of engineering comes into existence. Its aim is to master the laws of the subject and to apply them in the service of man. Each special field of Engineering implies a special knowledge of the laws underlying the science to which it is dedicated, and also the best method of its application.

The temples and pyramids of Egypt; the architectural ruins of Greece and Rome, Assyria and Babylonia; each new discovery of the excavator upon the desert's dusty face, all are the monuments erected to the genius of some engineer. And when standing among any of those ruins, and contemplating the fruits of his genius, one instinctively exclaims: "Si monumentum requiris, circumspice!"

The geologists' examination of the materials used in these ruins reveals that often the stones and timber in the edifice came from distant places.

Witness the construction of the most famous building in the world—Solomon's Temple!

> "And the house, when it was in building, was built of stone and made ready before it was brought thither; so that there was neither hammer nor axe nor any tool of iron heard in the house, while it was in building."
>
> (1 Kings, 6-7)

Those builders experienced difficulties:

> "The stone which the builders refused is become the headstone of the corner."
>
> (118 Psalm, 22.)

Contemplate for a moment the difficulties of transportation confronting those unknown engineers:—no roads, no vehicles designed for carrying heavy loads; the motive power always animals, more frequently men than beasts. Despite these difficulties they constructed mighty buildings, in designs which our own times have followed, and with decorations which have for ages been the basis of most embellishments.

The modern superintendent of the works, as he worries about the arrival of the next shipment of stone, bricks or iron, may take some comfort upon imagining this ancient engineer planning for the transportation of the big stones from the distant quarry, or anxiously awaiting the return of the caravan bringing the stones. In any event, while he thinks of this dusty group of camels, horses, oxen and men, he is not worrying about the arrival of this last shipment.

The skill of the ancient workman and genius of the engineer are still evidenced by the structures they built, and the marvelous accuracy of the workmanship in dressing and fitting the stones, between the joints of which not even a sheet of paper can be placed. Not more wonderful the way the last part of the modern cantilever bridge fits into its place, than the perfection of these ancient buildings.

The ceremonious "cording of the temple" with the knotted rope illustrates the crudity of their implements, and challenges the admiration for the results attained. The engineers knowledge of the importance of symmetry is constantly displayed in the beauty of their temples. How and where these engineers were educated is lost. Perhaps the great library at Alexandria may have contained this information; some diligent excavator may yet unearth the records detailing the system of technical instruction provided. The names of few of these early engineers have been preserved; but the name of the monarch who ordered the construction was frequently prominently placed upon the edifice, as upon the famous lighthouse at Pharos:

There is a cheerful story that is told
About a great Egyptian King of old;
He thought to build a light-house on an isle
That fronted on the delta of the Nile
He thought to take the money of the State,
Build something big, and be forever great,
He called for architects, selected one,
And turned him over treasure by the ton.
Upon an isle, o'er which the breakers curled,
Grew up the second wonder of the world;
Far o'er the land and distant ocean viewed,
Five hundred feet in snow-white marble hewed;
And on its summit watch-fires, day and night,
Directed shipping with a constant light—
The Tower of Pharos, capped with massive ledge,
Bearing the monarch's name upon the edge,
And o'er the sea for many a league marine
The Royal name of Ptolemy was seen.
The architect, unhonored and unknown,
Died, leaving all the credit to the throne;
The man whose splendid genius planned and wrought
Was not considered worthy of a thought.
Then died the King, and the people one by one
Spoke of the Tower he had done.
There stands the light-house, but each new decade
Beholds the King's inscription slowly fade.
It dimmer grows, until it fades from sight,
And then a new inscription comes to light;
The architect asserts his rightful claim—

Where stood the King's, now stands the builder's name.
The King's name, now wrought in stucco-work and paint,
Each year beheld grow dimmer and more faint;
Filled with cement, this sentence had been hid;
"For mariners. By Sos-tra-tos, of Cnid."
The rugged, massive letters, carved in Greek,
The builders and his residence bespeak,
While in the dust, upon the sea and shore,
The kingly name goes scattered evermore.

Few of those ancient engineers had Sos-tra-tos's genius for advertising.

Labor troubles did not worry those engineers. All the work was performed by slaves. The royal monarch or prosperous republic constructing the work furnished and supported these slaves. There was no other labor available. One of the marked characteristics of slavery was the master's control over the life of the slave; he was a mere chattel; for the master to kill him was no crime. Consequently there was no element of the modern concept of contract in the relation of master and slave.

All the ancient civilization was founded upon slavery. The system of slavery was devised for the very purpose of securing the labor to execute the public works and till the soil. The modern engineer can envy his ancient predecessor's freedom from all labor troubles.

The fall of the Roman Empire was more than the mere destruction of the government, it was the annihilation of slavery, and then the collapse of civilization. No one remained to labor. The land was not tilled, and consequently, no food for the people. Coupled with this was the anarchy which resulted from the destruction of stable government. There was no force to protect life and property; no legal means for apprehending criminals and inflicting punishment of their crimes.

With lack of food came famine, and plague followed famine. The constant effort of each man to protect his property resulted in repeated bloodshed, so that to famine and disease there were added "battle, murder and sudden death."

In such disorder there was a wholesale destruction of property, and as a result, cessation of advance in all the arts. No new construction, since neither artizan nor material could be secured. All progress stopped; learning vanished, save in remote Ireland. The period is justly called "the Dark Ages."

The Dark Ages measure the period the world was developing a new form of civilization. With no central government to provide police protection, maintain law and order, repress commission of crime and punish the criminal, each occupant of the land was compelled to organize his own system of defense and protection of his crops and property.

Thus the Feudal system was developed, the villein, attached to the soil, to produce the food for the soldier, who in turn guarded the villein while tilling the soil.

Slowly, painfully, empirically, the system was developed, a semblance of law and order was maintained, which finally culminated in the wonderful Thirteenth Century, and the completion of the Feudal system.

Once more there was an opportunity for the engineer to display his talents; and we witness the mediaeval cathedrals and castles, with their wonderful carvings and stained glass and "long drawn aisle and fretted vault."

The Feudal System had much more in common with the former slavery than with our modern economic organization. Even the mediaeval guilds exercised a restraint reminiscent of slavery.

The slow but steady development of a central government, strong enough to maintain law and order, gave to the tiller of the soil and artizan an opportunity to work and produce food and other necessary articles, and to enjoy the fruits of his labors. The protection thus afforded rendered unnecessary the maintenance of separate bands of soldiers to repel invasions from without and, the principal reason for the existence of the Feudal System being removed, it began to decline.

The better maintenance of law and order resulted in larger production of food and necessary articles for every day use and so, in course of time, there was an increase in the wealth of the individual. This increase was principally in personal property. There is a constant development of industry along specialized lines; the manor depends more upon the town for its supply of tools, implements and even clothing. Industry begins to be localized, thus creating a demand for transportation. Commerce becomes an important element in the industrial life of the people. In this manner credit enters into the business of the world.

All taxes are paid directly to the king, and become his property; out of the proceeds of these taxes and other revenue, the king maintains his army and navy, and pays the other expenses of government, including the cost of such public buildings and works as may be undertaken. But all this money is the king's.

The artizan, instead of being an independent workman, becomes an employee, working for wages. All the complex industrial, commercial and business relations which characterize our modern civilization were either in embryo or the course of development, including the wage system.

The construction of public buildings, other than religious, and public works was conducted under some form of wages paid the workman. But of greater importance was the construction of private edifices and roads and bridges and ships, and other means of commerce by private enterprise. All this work was performed by workmen receiving wages.

The increase in population; the growth of wealth following the law and order established under the Feudal system; the advance in the arts made possible by this increase in wealth; and the constant demonstration of the waste incident to the Feudal System, finally supplanted the Feudal System by our modern civilization. Then came the increase in individual wealth and the segregation of the King's funds from the State's property.

This increased wealth made possible the supply to meet the demand for luxuries which later became necessaries. This in turn required the development of transportation facilities, first by water and later by land. Therefore the engineer's client was more rarely the King or the State, more often the individual or corporation.

A new problem is now introduced; a new condition imposed upon the engineer,—time of construction and return upon the investment.

So long as the slave performed the labor, cost was of no importance; nor was time of completion of the essence of the contract. Seven years were consumed in building Solomon's Temple and more than two centuries in constructing some of the cathedrals.

The Temple, cathedral and castle were not designed to produce an income; only technical skill in design and talent in execution of plan were required of the ancient engineer.

Not so to-day; the modern twentieth century engineer must possess all that technical skill in design and talent in execution of plan and, in addition, he must consult utility, economy and productive capacity.

These new requirements impose upon the engineer many duties and differentiate him from his ancient and even mediaeval predecessor.

For every contract offered by the State or Church there are now a hundred given out by the individual and corporation. A return upon the capital invested, consisting of interest upon the bonds and dividend upon the stock, is the important consideration for the modern engineer. This involves calculation of investment of capital, overhead charges, taxes and cost of operation. All these items are to be paid from the earnings of the structure, be it factory, hotel, loft, railroad, water-front terminal, or a public utility.

Thus enter into his calculations, time of construction, cost of land, materials and labor. The design must be made with particular reference to cost of operation. The engineer must know much of many sciences, since the construction must conform to the use to which the structure is to be devoted. Provision for heating, lighting and plumbing must be made in his design. The location of appliances is the engineer's duty.

These new functions are more important than the mere technical knowledge required of the ancient engineer and much more difficult to perform. They are imposed by our modern civilization and econmic organization. The supply of men to meet these demands is one of the best tests of the success of our civilization.

The very object of civilized government is to maintain law and order, and to guarantee to every citizen the enjoyment of his certain unalienable rights of life, liberty and pursuit of happiness. The recognition of these rights and corresponding duties has evolved our system of law and jurisprudence. No man is above the law, every one subject to it. The relation of the engineer to his client is now legal, subject to our system of law. Thus the lawyer is introduced and becomes a necessary participant in the execution of the engineer's plans.

The advent of the individual and corporation as the engineer's clients joined the lawyer with the engineer. The contract for the construction of the engineer's plan; the title to the land for the structure; the employment of labor and purchase of material.

These and a hundred other details require the lawyer's services. He must be at the engineer's side; always advising the obligation imposed upon the client and rights accruing under all the various contracts and agreements incident to the execution of the work. It is comparatively easy for the lawyer to advise what cannot be done; quite another matter to devise the method of accomplishing the engineer's plan without a violation of some statute or infringement of some other person's right.

To many engineers the lawyer is a nuisance, necessary perhaps, but none the less a nuisance. He is constantly interfering with the engineer's freedom of action, reminding him of what must be done to comply with the law and what cannot be done.

And then the legislator with new statutes annually prescribing in detail how work must be done, hours of labor and wages to be paid for the labor employed. There is now scarcely a detail in the execution of a public work not regulated by statute. There stands the lawyer constantly reminding the engineer he must not do this, the statute forbids; and must do that, the statute commands.

Nor must the ordinances of the municipality where the work is being executed be forgotten. If the legislators have neglected to regulate every detail of operation, the municipal council with emulous promptness supplies the omission.

The lawyer reminds the engineer of the existence of these municipal ordinances.

The violation of each of these statutes and ordinances is made a crime, and the lawyer stands between the engineer and the threatened jail. The competent lawyer closes the doors of the jail—from the outside—by his constant admonition of the statutory and municipal prohibitions and commands.

Instead of a nuisance, the lawyer becomes the engineer's chief coadjutor; his co-worker, and necessary companion.

The lawyer also must consult economy of construction and operation and income after completion. Both lawyer and engineer are subject to the same conditions imposed by our civilization and must work in thorough harmony. It is the lawyer's duty to advise the method of keeping accurate records of the progress of the work, so that in case of dispute over the payments to the contractor there will be competent evidence to determine exactly what the payment should be. In case of delay or change of plans, the lawyer must prepare the proper demands to protect the rights of his client, absolve him from liability and secure him a legal claim for damages to be recovered from the other party. To accomplish this the engineer must furnish the facts. Only through the close and harmonious co-operation of engineer and lawyer can the client's rights be protected.

The increase of wealth has created these new relations out of which have grown the principles of the law of contract and of negligence. The engineer's work is now always performed subject to the application of these principles. The client's rights, duties and obligations are measured by the principles.

The physicians have developed a new department, called "preventive medicine"; so there is being developed by lawyers the field of "preventive law."

One of the modern lawyer's principal functions is to prevent litigation, hence he is consulted at the inception of the project. He advises the client what are his rights, what obligations he must assume under the proposed contract, and then drafts the contract to protect those rights and accurately to define the obligations imposed. To do this the lawyer must not only know the law, but must understand thoroughly the engineer's plans, method of their execution, and purpose of the structure erected, and its use after completion. All the various contingencies of strikes, delays, destruction by fire and the elements, and failure of the other party to perform all or a part of his obligations, must be considered and provision made in case the contingency becomes a fact.

The times, manner and place of payment as the work progresses; and method of computing amount earned under the contract, as well as precautions against accident and failure of performance, must be provided for in the contract. In the preparation of the contract the lawyer should seek to "take a bond of fate" for his client's protection.

The engineer's plans are executed pursuant to this contract.

Thus engineer and lawyer are co-workers in the enterprise.

The engineer must not only keep abreast of the advance in most sciences, but he must possess imagination. The loss resulting from imagination is demonstrated in New York.

In 1807 a commission was appointed to lay out a street plan for the city. At that time there was no development between Canal Street and Greenwich Village. The commission reported in 1813 the present plan of the crosstown street two hundred (200) feet apart, the north and south avenues much more distant and explained that, for all time to come, the main traffic would be crosstown, since it would be cheaper and more expeditious to cart freight from river to river than for the sailing vessels to attempt navigating about the Battery against the contrary tides and winds. The plan was rendered futile by the successful trip of Robert Fulton's Cleremont up the Hudson August 11th, 1807. And Fulton was a portrait and landscape painter before he became a mechanical and civil engineer.

It was James Fenimore Cooper who foresaw and predicted the invention and development of the passenger elevator, and the construction of the twenty, thirty and perhaps forty-story buildings upon Manhattan Island, and the conversion of the streets into canyons, and the inadequacy and obsolescence of the sewer and water systems in the streets. Cooper was neither lawyer nor engineer!

Man's readiness to convert the luxury into a necessity directly he possesses "the price" imposes upon the engineer the task of devising ways and means to produce the article in quantity and at a price commensurate with the demand and capacity to purchase.

The development of the oil industry is an apt illustration. Not only was it necessary to devise the methods for producing the kerosene commercially, but appliances for its utilization as an illuminant had to be devised before a demand could be created. The universality of its use demonstrates the engineer's success in meeting the situation.

The progress of the arts is largely dependent upon the engineer's skill and imagination. The economist and statistician can easily calculate the time when the world's population will exceed the world's productive capacity, present conditions of production remaining constant. Only the advance of the arts has prevented the application of the law of Malthus.

To pursue this branch of the subject further will lead to the pleasant but not necessarily profitable field of speculation, and it had better be left for more capable hands.

The lawyer essaying the engineer's function is not less disastrous than the engineer's folly in attempting to be his own lawyer. Their co-operation, each in his own field, leads to success.

"One Science only will one Genius fit;
So vast is Art, so narrow human wit."

Brethren, we have much in common! While the scales of Justice are never instruments of prevision, we are striving to reduce their error to a negligible degree and the tolerances are now within well-defined and ever-narrowing limits.

The Law Giver who carved the decalogue on tables of stone brought the light of law into the darkness of the Wilderness. As rules of human conduct, these are the foundation stones of all judicial systems whose statutes and codes embody their living principles. The Moses who brings the light of knowledge to us still in the wilderness of comparative ignorance is that pioneer, the research engineer, who prospects in whatever region of the unknown. The decalogue he seeks to transcribe frames the immutable laws followed by Natural Forces yet occult.

"The Two Books of Francis Bacon," himself the engineer and lawyer, recorded "The Advancement of Learning" as "Divine" and "Human." An arbitrary division. All learning is from the one Source. All laws are the creation of One.

I submit that neither is there any division between the Engineer and the Lawyer. They are species of the genius which seeks to apply the laws revealed for the welfare of the world. Their laws are various. Their forums are different; but their purposes are single. "Many roads thou hast fashioned—all of them lead to the light." "Lux et Veritas."

In the co-operation of the engineer and the lawyer, in advancing the appliances our modern civilization requires, the lawyer has permitted the engineer to gain the publicity and fame success has brought, content to take a modest fee, and enjoy the satisfaction rendition of service to mankind brings.

THE NEW WASHINGTON BRIDGE OVER THE HOUSATONIC RIVER

Richard L. Saunders, Deputy Highway Commissioner, of Connecticut.

The Washington Bridge spanning the Housatonic River between the towns of Milford and Stratford occupies an historic site. As far back as 1648, one Moses Wheeler of Stratford petitioned the Fairfield Court for permission to operate a ferry at this point, and either he or his son operated on extensions of this grant for a period of more than sixty years. It is on record that George Washington passed over the river on this ferry not less than seven times, and it is on this account that later structures were often referred to as the Washington Bridge. The first record of any bridge at this point is that of 1802, when Jonathan Sturges and others secured the right from the General Assembly to build a "structure upon stone piers and having a draw opening of at least 32 feet." The Company building and operating this structure was known as the Washington Bridge Company and was empowered to collect toll from all passengers. In 1806 the bridge was completely washed away by the spring freshet and carried out into the Sound. Another was immediately built to replace it and carried traffic in a satisfactory manner until 1868 when the draw span collapsed upon a passing steamer. For the next five years traffic had to detour ten miles north to Derby. In 1872 the Towns of Milford and Stratford appropriated sufficient money to build a new draw span and repaired the rest of the old bridge, opening it to traffic in 1873. This was the last wooden bridge erected, for in 1892 the Counties of New Haven and Fairfield, which had by this time assumed charge of the structure, erected the steel structure which has just been superseded. In 1897 the trolley company first operated cars over this, but before doing so, expended a large sum of money in strengthening the floor system, which was inadequate for much heavy loads.

In 1915 the State Highway Department assumed charge of the structure by a special Act of the Legislature. An examination of the entire bridge at that time by the Department and the Engineers for the Trolley Company resulted in a decision to continue to use it for a period of at least five years. Meanwhile studies were begun with a view of replacing the old steel structure with a more permanent type. The channel lines were definitely fixed by the United State authorities. The old draw span had two openings of 75 foot clearance each and a single opening of 90 feet was proposed. Local interests, however, petitioned for 150 foot clearance and a compromise of 125 feet was finally agreed upon. A careful series of borings showed bed rock extended from mean low water elevation on the east shore to elevation minus 90 on the west bank, running almost uniformly between these points. After a comparative study of various designs had been made five open spandrel arches of 100 foot span were decided upon for the main structure with a lift span of 175 foot clearance. In addition to this the approaches on either end were built as T-beam spans, three in number. This latter type was used to reduce the expense of building the massive abutments and wing walls which would have been required to withstand the pressure from the high back fill.

The New Bridge is located north of the old structure just far enough so that during construction the old span could be opened to pass navigation at all times. On the east end approach is a gradually ascending curved grade and on the west a very deep fill over the old meadows was made to a point 700 feet distant, where the old road bed was intersected. The structure is built high out of the water to give good rise to the arches for economical design as well as to give channel clearance and avoid opening the lift too many times to accommodate small vessels. Considerable time was spent in investigating the design of the substructure. Pneumatic foundations were discarded on account of the excessive cost, and it was finally deemed advisable to drive reinforced concrete piles to rock on all piers except the east abutment, which was built direct upon bed rock. The footings for the three west approach girder spans were made by driving wooden piles to a deep gravel strata overlying the bed rock. With the exception of the concrete piles driven to bed rock there is nothing unusual about the pier design. Upon the piles a concrete pier was built, the upper part of which was faced with granite from the spring line to a point two feet below mean low water. Six heavily reinforced arched ribs six feet wide carry the superstructure proper; those under the trolley being of somewhat heavier section than the others. The thickness at the crown is two and one-half feet, at the spring line five feet. The deck is supported by arched columns resting upon the back of the arch ribs, which are braced at intervals by concrete. The design of the deck is somewhat unusual to accommodate the trolley tracks. To reduce vibration to a minimum and also to provide a cushion for the track, the center section was depressed enough to permit the placing of six inches of ballast under the ties. The distance between curbs is forty-three feet and in addition two eight foot sidewalks are cantilevered from the outside arch ribs. A simple concrete handrail completes the deck.

Another interesting feature is the cantilevering of the operator's house as well as the comfort station on deep concrete brackets. The interior design of the bascule piers is rather complicated to accommodate the counterweight and operating machinery. The channel is spanned by a double lift leaf of steel with a three inch creosoted deck supporting a three inch wood block pavement. The sidewalks are of concrete, another quite unusual design. The bascule is that known as the Brown type being a true trunnion-bearing lift with a box girder axle. The trunnions proper are eighteen inches in diameter, and rest in shoes having large set screws for accurate adjustment. Two curved girders with curved gussets comprise the understructure. End locks are provided and, as usual, the entire outfit is electrically operated with one exception, namely, that, instead of the electric brake commonly used, an ordinary air brake is installed. Operation of other lift bridges has convinced the Department that a simple air brake gives better control of the moving leaf than the magnetic type, which acts too violently and cannot be eased off so gradually.

Work commenced in July, 1919, on the foundations and west approach. The pier foundations were first excavated to a depth slightly more than called for to allow for upheaval of the bottom due to driving the piles. For driving these a special rig was necessary owing to their great weight, which for the longest piles, fifty-two feet, amounted to four tons. Latticed girder leads were constructed and the piles sunk by using a 6,000 pound steam hammer assisted by a water jet. When the piles were in place a cofferdam of steel sheet piling was driven around these and the concrete placed under water by the use of the tremie. Practically all the concrete, which was a 1-2-3 mix for the footings, was mixed in a floating plant; the sand, stone and cement being supplied from a scow alongside. The mixer discharged into bottom dump buckets which held a cubic yard each and were then swung by derrick on a lighter close by. The derrick on the mixer lighter fed the mixer and that on the sand stone lighter removed the mixed concrete and deposited it in the tremie. This tremie was made on the job—twelve inch steel pipe with a bell-shaped under end. Two heavy chain falls attached to a heavy hopper supported the tremie in place, which was not underneath but to one side of the hopper. This hopper was of four cubic yard capacity, mounted on skids which rested upon the crow-braces of the cofferdam. In operation the tremie was first raised and a wooden plug placed in the bottom; then lowered to place and filled with concrete from the hopper. It was then slightly raised from the bottom of the excavation and the concrete of 1-2-3 mix allowed to slowly ooze out, care being taken to keep the pipe filled at all times. As the mix was kept comparatively dry, very little trouble was encountered and as many as 200 cubic yards placed per day without loss. The piers were concreted in this manner up to point six feet below low water, when the coffer-dams were pumped out and the rest of the pier constructed in the dry. From an elevation of two feet below low water, all piers were faced with granite up to the spring line of the arch ribs.

In the design of the arch ribs the radius of the central curve of each was made the same down to a point a few feet from the spring line. This was to enable the same centering to be used throughout with a slight modification. The contractor took advantage of this by having steel arch rib centers made for the full span, practically, and blocking out from them to obtain the proper changes of curvature near the spring line. Centering for two complete spans of six ribs each was used set in place by a lighter. Upon these centers the rib forms, made in panels, were placed and concreted. In order to keep the trust on the piers within safe limits, not over three ribs were poured on any span, without a corresponding number on the adjacent one. At the same time the ribs were poured the bases of the column were also carried up for a short distance so that a horizontal joint would be obtained. Forms were left in place from twenty-one to twenty-eight days depending upon the weather and then removed and reused. Concrete for the ribs and columns was run in by chutes, while that of the deck was placed by using buggies. One of the most expensive and slowest parts of the whole work was in constructing the deck houses. These being so far cantilevered required a large amount of false work for their support.

The regulations of the War Department required the erection of the lift structure in the open position so that navigation would not be delayed. In so far as the steel erection was concerned, this was no great task, but the placing of the wood block floor was greatly hampered. The sidewalks, which were of concrete five inches thick, could not be placed any other way than in the horizontal and, as there were only a few cubic yards all told, a favorable opportunity was seized, when no river craft was expected, to place this. The entire roadway except the lift span has a three inch sheet asphalt wearing surface, as well as the approaches. The length of the structure over all is 867.33 feet, 25,000 cubic yards of concrete were used, 1,250,000 pounds of steel reinforcing and 1,625,000 pounds structural steel in the bascule. In addition to this 35,000 linear feet of concrete piles ranging from 24-50 were used in the pier foundation.

The bridge was opened to traffic November 1, 1921, two years and four months after construction started. T. Stuart & Son Company of Newtown were contractors for the concrete structure and the Bethlehem Steel Bridge Company for the bascule span. All work in connection with the design and construction of the concrete structure was performed by the Engineers of the Highway Department under the direction of the Commissioner, Charles J. Bennett. The bascule span was designed by Waddell & Son of New York.

THE SEWERAGE SYSTEM OF THE CITY OF STAMFORD

By Paul Nash, City Engineer.

In the years 1886-8, when Stamford, with a population of about 8,000, was still a borough (having been incorporated as such in 1830), the original sewerage system was built. After much controversy over the question as to whether to build a part gravity and part pumping or a complete pumping system; and whether separate or combined sewers should be built as advocated by two different engineers, it was finally determined to build a separate system; pumping all the domestic sewage and a gravity system for storm water sewers after plans of Col. Geo. E. Waring, Jr. of New York City. The plans called for a gravity system of sanitary sewers leading to a central pumping station from whence the sewage was to be pumped into Long Island Sound, about one and three-eighth miles. Storm water sewers were planned for a few localities where it was found convenient to empty into some nearby water course, but no attempt was made to parallel the sanitary sewers. It is the intent in this paper to consider the sanitary sewers only.

Stamford is situated on Long Island Sound and, although it is a city of hills and valleys running generally north and south, there is a considerable portion of area south of the N. Y., N. H. &. H. R. R. and bordering on the Sound, the surface of which is low, about one-third of it being diked and lying slightly below mean high water while most of the remaining two-thirds is very little above maximum high water. This section is and always has been the principal manufacturing center and populated. The combined gravity system was to deliver to a storage reservoir to be emptied at ebb tide.

There were also two alternative propositions submitted by Col. Waring, one for a part gravity and part pumping system, the other for a full gravity system using a storage reservoir to be emptied at ebb tide and contemplating a series of small independent sewers discharging directly into the Stamford Canal. The system as built is known as the Waring system and was among the first of the separate systems built in this country. It was covered by patents setting forth many details that were then supposed to be essential. The underlying principles of the system as defined by Col. Waring were as follows:

No. 1. The use in the construction of sewers of pipes of small diameter, adjusted solely to carry dirty water and fecal matter but no rain water.

No. 2. Ventilation of the sewers and house drains by means of pipes opening above the roofs.

No. 3. Direct communication of each private drain with the sewer without interruption of any diaphragm or hydraulic seal.

No. 4. Daily washing of the sewers by flushing tanks at their heads.

The sanitary sewers, as built, consisted of the following lengths and sizes of vitrified shale pipe and each and every street in the Borough was provided with a sewer: 44,879 ft. 6″; 11,354 ft. 8″; 8,136 ft. 10″; 2,077 ft. 12″; 3,161 ft. 15″; and 1,015 ft. 18″. Total 70,622 ft., or a little more than thirteen miles.

The length of stormwater sewers were slightly over two miles. The total cost of building both was about $105,000.00. Sewerage is delivered by two main lines, one of eighteen inches from the northerly and one of fifteen inches from the southerly section of the borough into a central collecting well, at a depth of thirteen feet below mean high tide and about five and one-half below mean low water. From this well was an emergency outlet into a four foot storm sewer emptying into the Canal. All of the sewers laid in the low sections are below mean high tide and a considerable portion below mean low tide. The pumping outfit is three units, each a ten inch plunger pump of 400 gal. p. m. capacity, driven by direct spur gear connection with an Otto gas engine. The pumps deliver into a stand pipe, from which a twelve inch vitrified pipe outlet about 6,000 feet long extends to the shore, with 1,200 feet of twelve inch C. I. pipe extending into the Sound at Wescott's Cove. There are thirty-seven manholes, sixty-eight automatic flush tanks of 145 gallon capacity each, and three larger flush tanks in the entire system. The sewers were provided with a few manholes on lines of ten inches or more in diameter, and with inspection pipes or lamp holes and hand holes on eight inch and six inch lines, placed about 100 feet apart. In a few cases manholes were built over the smaller sewers, the pipe being laid continuous through the manhole in all cases, with an oval hand hole cut in the center of pipe with cover piece of tile. The inspection pipes or lamp holes were six inch tile, leading vertically from T's in the sewer line to a point about one foot below the street level with cover of tile cemented into bell of pipe; it being the function of these stand pipes to assist in locating stoppages.

The handholes were merely oval holes cut in pipe with tile cover made to lap over edge, and cemented on, the idea being to dig down to sewer line at these points should any stoppage in the line occur. All laterals from side streets were joined with the trunk line by regular Y connections, the approach being made by a long curve meeting the Y connection in the main line on a forty-five tangent and handholes are located just below and close to each connection. Pipe joints in dry trenches were made of one part Rosendale Cement and one part sand. In wet trenches a patented joint called the Stanford moulded joint was used. It was composed of brimstone, coal tar and fine dry sand and, from Mr. Waring's account, made a very satisfactory joint. It was used throughout the 6,000 feet of tile force main, but considerable trouble was experienced with leaks and blowouts on this line. In Col. Waring's book on "Sewerage and Land Drainage" published in 1889, he makes the following statement: "Two elements of Stamford sewerage were mistakes. The most important one was the resort to gas engines for pumping power. This would have been all right had we been dealing only with ordinary wet ground and only the amount of leakage incident to such ground. So much of the system is laid under a head of free flowing water that even pin holes become serious and a cracked pipe collar very serious; therefore, although the amount of leakage has been reduced to what would only be considered an advantage, with a view to clean current, in a gravity system, and would not be worth considering with steam pumping, it is somewhat serious with gas pumping when the amount of fuel consumed bears a most exact relation to the amount of work to be done. I believe that gas engines are well suited to the pumping of sewage under the separate system in all cases where only the ordinary amount of ground water is to be contended with. The other mistake is one which was especially unfortunate in the wet work, but which I think would be a mistake under any circumstances; that is, the requirement in these specifications to extend each four inch Y branch for house connections with a two foot length of four inch pipe. It was more difficult for the inspectors to control the manner in which these pipes were supported and the character of the filling about them than to control any other part of the work.

"In many cases we found, in making repairs, that the support given to the pipes had been washed away, allowing them to fall and open the joint or even break off the bell of the branch; either difficulty opening a serious leak in the system. While the recommendation to introduce this pipe during the first of the work was especially bad in Stamford, I am satisfied that it would not be good anywhere. Its purpose was to keep the plumber at arms length from the sewer and allow him to break only this extension piece, if he must break anything. The result has shown that the extension pieces themselves probably broke more Y branches than would have been broken in the house connections of the whole borough."

Most of these four inch extensions have been removed as house connections have been made. A lime mortar joint was used at the Y connection with a premoulded vitrified plug at the end of the two foot pipe; this too was jointed with lime mortar so as to avoid breakage by the plumber, which might happen with a harder joint. No attempt has been made to make systematic repairs where these two foot extensions for house connections remain but one twelve inch trunk line in the southerly section has been entirely replaced with C. I. pipe. This became necessary because the pipe was found to be broken and its cross section in places quite contracted. This pipe failed from lack of side support, and it very likely was cracked shortly after being laid, but served in this condition for many years before collapse. In laying sewers a soft bottom was encountered in a considerable portion of the southerly section and saddle piles were used as artificial supports. They were inch boards pointed at the lower end and driven to a firm bearing. The upper end was sawed out to the radius of the outside of the pipe, and, with a suitable header, the pipe was driven to the depth required. We know that a considerable portion of the pipe in this section is not perfect and that it leaks badly due to broken pipe and defective joints, often finding it under a pressure of two or three feet head in the spring of the year when making house connections or repairs. When the original pumping outfit was put in operation it was found barely capable of handling the flow of sewage and infiltration water combined, so a steam pump was installed as an auxiliary.

No additions were made to the pipe system until 1893 when the limits of the borough were extended and Stamford was incorporated as a City. It was determined that a new pumping station of ample capacity should be built some 1,500 feet south of the original station and a main line twenty-four inch C. I. extended thereto connecting with the fifteen inch and eighteen inch inlets to the old well. This station built in 1893-4 is the one in use to-day, although the equipment first installed wore out and was supplanted by more modern and efficient machinery. The displaced machinery consisted of two identical independent units each a twelve inch horizontal centrifugal open runner type pump, belt connected to a thirty-five H. P. vertical engine and run by two horizontal boilers of forty H. P. each. This machinery gave about fifteen years of continuous service and, in 1908 was replaced by the present outfit. When the new pumping station was built a new force main of twenty inch C. I. pipe was built following practically the same line as the old twelve inch vitrified to Wescott's Cove. Pipe which was on the shore, below high water mark, has been salvaged after lying on the beach for twenty-eight years and is as good as new.

Ventilation of Sewers:

The Waring system provided that no main trap or other obstruction to the free circulation of air from the main sewer to the top of the stack in sewer service connections be allowed. This rule is still written in the plumbing ordinances of the city and has always been rigidly enforced. The intent was to incite a swift circulation of air throughout the entire sewage system and thus prevent any possibility of sewer or other gas accumulation. This plan has proven to be practical as odors of gases are never evident. Of late years, however, all plumbing fixtures have been back vented so that trap seals will not be disturbed by suction due to flow in stack.

Stoppages in Lines:

The stoppages in the sewer pipes are very infrequent, averaging possibly a half a dozen per year and most of them due to abuse.

Where stoppages occur, which cannot be rodded or flushed out and where the street has to be dug up, a manhold is generally constructed at this point for future use, but no systematic manhole construction has been carried out on the original system.

Sewer Extensions:

The original sewers were evidently not designed in anticipation of much sewer extension from the fact that every sewer terminal, with one exception, was provided with a six inch pipe. There are cases where extensions of a mile and more of sewers have been made at the end of a six inch terminal. The practice has been followed in Stamford, ever since it became a City, of laying a line of pipe not less than eight inches diameter in every street, of laying all sewers in straight lines and building manholes about 300 feet apart; so in many instances we have eight inch lines flowing into six inch lines. The total mileage of sewers is thirty-seven miles, or about three times the length of the original sewers. This increase however has added no burden to the old system as connections have been made on the new trunk line already referred to at or below the old pumping station. In the year 1900 a section west of Mill River was connected with the old system, crossing the river to a ten inch line. This overloads the sewers at this point in the spring of the year so that the pipes are running under pressure but not enough to do damage by backing up in houses, and is evident only during heavy rains when the ground is full of water.

In 1904 what has been called the "East Side Sewer" was built. It was planned to cover a territory calling for about ten miles of pipe sewers and was a gravity system having an outlet in Wescott's Cove and of this about eight miles have been built. In the design of this sewer it was so planned that at some future date, if found necessary, it could be connected with the pumping station and the outfall into the sound abandoned. This change was made last year by laying a line of eighteen and twenty inch C. I. pipe, 3,000 feet long. In 1910 what has been called the "West Side Sewer" was constructed. This was planned to cover a territory calling for about ten miles of pipe sewers—of which about eight miles have been built. This connects with the eighteen inch trunk line of the old original system by an eighteen inch trunk line.

It was found necessary to erect a pumping station in the Waterside section and lift the sewage of a small portion of this west side area. There are two sections, one in the extreme easterly and the other in the westerly sides of the City, which are not provided with sewerage. Preliminary studies are now being made with a view to adopting some definite method of procedure in the matter of sewerage for these areas. They both lie beyond hills and portions of them are down quite near to high water level.

Pumping Station:

As before stated the present pumping station was built in 1893-4. The building is of brick and is thirty-five feet by eighty-four feet outside dimensions. The pumping outfit comprises three units, two of which are electrically driven and the third by gasoline engine. The electrically driven units are in duplicate and were installed twelve years ago to supplant the original steam outfit. They consist of ten inch vertical open runner centrifugal pumps of 2,500 gallons per minute rated capacity, placed at the bottom of a dry well about twenty feet below the floor level of station, operated by thirty-five H. P. vertical motors at floor level. The pumps were renewed last year after eleven years of continuous service, while the motors are still good. The twelve inch suctions from these pumps lead from a collecting well beneath the floor of the station into which the twenty-four inch main trunk line sewer empties, this being the only inlet. The well is ten feet in diameter and twenty-four feet deep and is alongside of pump pit. The motors are 2,200 volt, a. c. 600 R. P. M. and are supplied with current by two lines, one special and one commercial line, each carrying this voltage direct from Electric Station.

In 1919 it was determined that an auxiliary unit where other power than electricity should be employed, and the third unit a sixty H. P.—three cylinder gasoline engine direct connected to a fourteen inch horizontal centrifugal pump rated at 7,000 gallons P. M. at 300 R. P. M. be installed. This unit is at the station floor level with a suction extending down into the sewage well. It is equipped with a compressed air and vacuum outfit for starting engine and priming pump suction respectively. It was installed as an emergency outfit, to afford service should electric current fail, which does happen once in a great while during electric storms, or should the other outfit become in any way disabled. There is no emergency outlet at the station and it is of course very essential that the pumping does not cease longer than a few minutes, the sewer pipe system affording the only storage. A decided difference has been noted in the duty required of these pumps since the long twenty inch force main was discontinued and pumping to the Imhoff tanks was begun. When the heavy rains and high tides came simultaneously and the force main was twenty inches in diameter and a mile and more long, it meant very hard pumping duty against the head created and with an excess sewage as well. As the sewage is now pumped to the Imhoff tanks, the opposing head is practically a constant factor disregarding of course the variation of level of sewage in well. The screening of the sewage is by a double vertical rod screen guided in slots across the center of the well which is lifted up and man cleaned twice per week, employing an overhead traveling crane in doing this work. It is proposed to construct a new screen chamber just north of the pumping station.

SEWAGE DISPOSAL:

About fifteen years ago a revived agitation for the acquisition of land by the City for a public park was started and it was decided to purchase a tract of eighty-eight acres with a frontage of about 2,400 feet on the shore of Wescott's Cove.

The fact that all the sewage of the City emptied into Wescott's Cove did not defeat the measure as this tract was the only one available.

After completion of the park development in 1912 the demand to remove the sewage outlets and provide clean bathing became more and more urgent.

It was determined to build Imhoff tanks with sterilization of the effluent.

Accordingly a tract of land about twenty-two acres in extent located on the easterly side of the Stamford Canal, comprising several adjoining parcels, was obtained with a frontage of about 1,230 feet on the Canal and a depth of 750 feet.

The land is situated directly south of the sewage pumping station and adjoins the land on which it stands, and it is here that a sewage disposal plant has been erected.

The force main consists of a thirty inch reinforced concrete pipe extending from pumping station to the north-east corner of Imhoff Tanks, the greater portion of which is laid on hard bottom and the remaining portion on piers, and just outside the pumping station building is connected with thirty inch C. I. pipe. A gate valve was placed here to expedite final connection with force main at pumping station and to insure control of sewage flow should it have been found necessary to shut off from the tanks at any time during the tryout. Just before reaching the tanks a Y branch of C. I. was inserted in the main to afford further extension of plant in a southerly direction.

IMHOFF TANKS:

These tanks are of a design like many that have been built elsewhere, differing only in arrangement of details. There are four parallel tanks, but each complete in itself as far as its functioning is concerned, occupying a total rectangular area ninety feet by one hundred fifteen feet. The maximum depth of these tanks is thirty feet nine inches. The contents of settling compartments is 56,000 cubic feet and that of the digestion compartments is 79,000 cubic feet. Each tank has three hopper bottoms, making twelve for the battery of tanks. An overhung channel five feet in depth below the top of tanks and thirty inches wide extends entirely around the outside of the tanks. At the north-east corner of this channel the sewage enters, controlled in its direction of flow by four sluice gates across the channel, one on either side of the inlet, one at the south-west and one at the north-west corner, and by stop planks placed at intervals. By a further arrangement of sluice gates, one at either end of each flowing through compartment, there being two in each tank, it is possible to operate any tank separately or any combination of tanks in whole or in part, and in series or parallel. The clarified effluent passes out of the channel at the middle point of the westerly end and on to the venturi meter in the laboratory building. The height of flow line in the tanks and channel can be regulated by flash boards across this channel outlet. Four scum boards for each tank were installed, and a removable one-half inch mesh wire screen placed across the effluent outlet as a safeguard against the possible escape of stray floating material into the outlet. At the center of each hopper is a vertical stand pipe, eight inch C. I., extending vertically from bottom to top of the tank with a plug at the top for clean-out purposes and connecting with a horizontal pipe of same diameter at a point about two and one-half feet above the level of the sludge beds and seven and one-half feet below top of tank. These pipes are for removing sludge from the hopper to the sludge bed. The control of sludge flow is by a quick operating gate valve located between tanks and sludge beds, the static pressure of water in tanks driving the sludge, this head being about five feet.

Each hopper is provided with two inch perforated flushing pipe extending around and at about two-thirds the way up its side slopes, for use in agitating the sludge when necessary. Sluice gate in end of tanks. Pressure is obtained from a small horizontal electric driven centrifugal pump of 100 gallon P. M. against a working head of 120 feet located in the basement of the laboratory building and the pump suction is from the effluent outlet beyond the venturi meter. The pump also supplies water for cleaning and washing down tanks.

The land upon which the plant was built is ordinary salt marsh, the top stratum being the customary salt meadow bog varying from a few inches to six or eight feet in thickness was occasional pockets of greater depth and an underlying stratum of gravel increasing in fineness with its depth. Ten feet of the tanks is above original grade, which is approximately mean high water level, and twenty feet is below. The entire land area to be utilized for the project was first encircled by a dyke of salt marsh bog, built up higher than maximum high water to exclude tide water. The excavation was made some six or eight feet larger all around the outside of the tank foundations and no regular sheet piling was driven. It was found necessary to use sheet piling only from the top to the bottom of the hoppers, ten feet in depth around a portion of the excavation. The insides of the tanks were given two coats of special damp-proof paint as a precaution against disintegration of concrete.

Sludge Drying Beds:

The sludge beds are located one at either end of the tanks with an intervening space of about eighteen feet. They are of equal size, each one divided into four compartments and having a combined area of 17,000 square feet. They are constructed of graded courses of broken trap, from two inches at the bottom to one-eighth inch on top with one inch coating of coarse sand with a maximum bed thickness of sixteen inches and minimum of ten inches. Concrete walls surround each sludge bed, eight inches thick and four feet above the surface of the beds. The sub drains are of vitrified pipe, the main line being eight inches and laterals four inches which drain to the effluent chamber in the laboratory building. Between the sludge beds and the tanks are manholes built integral with sludge bed walls through which run the eight inch C. I. sludge pipes and where the gate control of sludge and wash water is located.

Detention Tank:

This is located on the bank of the Stamford Canal; the outer side of the tank is twenty-five feet back of the harbor line, it being proposed to utilize this as the rear support for a twenty-five foot pile and timber dock. It is forty by twelve feet, inside dimensions, and is of reinforced concrete with cover. It has a longitudinal partition through its center with the exception of three feet at the further end and is provided with an adjustable flash board weir at the end of the eighty foot flow. This tank was built for a detention period of fifteen minutes for effluent after application of chlorine. It has outlets into the Canal consisting of three twenty-four inch C. I. pipes, three feet on centres and twelve feet long discharging below low water.

Operation of Plant:

When sewage was first turned into the tanks only about half of the full flow was admitted, the flow being easily controlled by gate valves at pumping station to prevent agitation. No artificial seeding of tanks was resorted to, but it was about a month before signs of good septic action appeared in any tank and it was three months or more before all seemed to be properly working. This was probably due to an unequal distribution of sludge in the hoppers, and it was often found expedient to cut out and put back into service various portions of the tanks. Late in the fall sludge was drawn from two hoppers which were the fullest and the sludge was quite satisfactory in quality. The plant is handled by an operator with the help of one laborer and receives no regular attention during the night.

The duties of the operator are to break up the scum mats in the gas vents; to wash down all exposed surfaces where there is accumulation of sludge; occasionally to change flow through tanks so as to get as nearly as possible an even distribution of sludge in the various hoppers; to engage and disengage liquid chlorine cylinders with the chlorinating apparatus, which is automatic in its action and is regulated to feed as many pounds as desired of chlorine gas per million gallons of sewage flow independent of what the actual sewage flow is, and to look after the general welfare of the plant.

He makes daily records of sewage flow as indicated on self recording meter, of the amount of chlorine gas used, of sedimentation tests of raw sewage and effluent, of stability tests with methylene blue, of what tanks are being used and a weekly tabulation is made of these and other minor details for inspection and permanent record.

Once each week bacteriological examinations are made by the city bacteriologist. Samples are taken of the effluent as it leaves the tanks and of the sterilized effluent in the detention tank and the removal of bacteria in this chlorination process is from 93% to 99.9% with application of from eight to twenty pounds of chlorine per million gallons. The removal of settleable solids after a settling period of two hours averages about 90% in volume. No complaints have been entered by residents in the vicinity of the plant. When the plant was first operated an odor of hydrogen sulphide was evident in the immediate vicinity, but after a short time very little odor of any sort was noticeable.

Capacity of Plants.

The plant is designed to dispose of the sewage of 50,000 people. On an average the plant will be capable of treating some six or seven million gallons of sewage per twenty-four hours, and for short periods will treat as much as 10,000,000 gallons daily. The flowing through or detention period varies with the amount of the flow and is not constant. The detention period being defined as the time taken to displace the sewage in the settling compartments of the tanks or, in other words, the time required to fill them when empty, at a rate of 3,250,000 gallons per day and with the total setting capacity of 56,000 cubic feet or 420,000 gallons, flowing through time would be about three hours. The average recorded daily flow is about 3,250,000 gallons. The maximum recorded daily flow is about 4,747,000 gallons. The highest recorded peak flow is at the rate of 5,000,000 gallons for a period of five hours. The minimum recorded flow is at the average daily record of one and one-half million for two and one-half hours. The population utilizing the sewers is about 25,000. The per capita consumption for domestic use as determined by the Stamford Water Co. is about seventy-five gallons per diem. This would mean a sewage flow of 1,875,000 gallons. If these figures are not exact, they cannot be far from right, and it shows much infiltration of water into the system. No effort has been made to conceal the fact that the City of Stamford must in the near future rebuild a goodly portion of its sewers; but so long as they afford reasonable service, are sanitary and cause no special inconvenience it is much cheaper to pay for extra pumping than to rebuild the sewers.

STREET WIDENING

Charles A. Ferry.

While the subject of this paper is not, necessarily, of an engineering character the problem which forms its basis is one which, apparently, will have to be solved by engineers if it is solved at all: viz., how can the congestion in our city streets, due to the automobile traffic, be relieved without entailing prohibitive cost on the municipalities.

Our ancestors, who settled this country, with a wide vision, and an unlimited area of land at their disposal, made lavish provision for traffic in laying out highways; in some instances two or three hundred feet in width; although these wide, parked highways were, probably, established more with a view to their use as market places or fair grounds than for future traffic.

The men who settled New Haven were not as liberal in the bestowment of land for public use—unless the reservation of our central Green may have been intended for the same purpose as that for which the wide thoroughfares above mentioned were laid out. But, in the early years of the Colony, it was voted that the "highways should be and remain where they now are, four rods in width." If they had remained four rods in width, the ills of traffic, from which we are now suffering, would be somewhat less. Unfortunately, however, property owners cast covetous eyes on the land which seemed to be wasted and they gradually encroached upon the highways until there is scarcely a single block in the whole city in which the street is of the width thus laid out. As no definite boundaries were then established it is, of course, impossible to now reclaim for the city the land which has thus been appropriated to private use.

As the city expanded and new streets were laid out, even this comparatively liberal policy was not followed and fifty feet was the prevailing width of streets although many were made only forty feet and some even less.

A few decades ago space for a vegetable garden and for the planting of fruit trees was a valuable adjunct of a house lot, and most of our streets were laid out far enough apart to provide good depth of lots for this purpose. Now, market gardens are everywhere in close proximity to the cities and, with hucksters calling at the door, the average family can supply itself with better fruit and vegetables, and at lower cost, than can be produced at home. With the introduction of office buildings many stories in height in place of three or four story buildings which are the practical limit where dependence is placed upon stairs, wider streets are necessary not only for air and light but for the accommodation of the small army of employees housed therein. Formerly horses for pleasure driving were kept by only the wealthy few; now automobiles are owned and driven by the many, both wealthy and otherwise. With these changes in living conditions, the necessity for yard space is lessened while that for wider streets is greatly magnified. The problem is, how can the waste space in the back yards of our cities, where it is not required, be economically transferred to the streets where it is greatly needed?

As to what future traffic conditions will be, of course, no one can tell with certainty. But we can draw some conclusions from the history of the past few years. Since 1915, the number of automobiles licensed in Connecticut has increased over two hundred and seventy per cent; the curve of the rate of increase during that period being almost a straight line. If the present rate of increase continues in the same straight line until 1930, the number of automobiles in use then will be about 275,000; double the number licensed last year. Of course, the present rate of increase cannot go on indefinitely, for it is much greater than the rate of increase in population, and it is inevitable that the line must curve downward ere long. But assuming that the population of the state has the same rate of increase between 1920 and 1930 that it had during the preceding decade, then with double the number of automobiles in the state which we now have, the number, per one thousand of population, would be only a trifle more than it is reported to have been in California two years ago. It seems not unreasonable, therefore, to suppose that this number will be reached within a very few years. With twice the number of vehicles on our streets which we now have during the busy hours of the day in summer, one dreads to think of the volume of profanity which will be let loose by those who are so unfortunate as to be obliged to travel our streets under these conditions.

In the widening of streets, the major part of the expense is the payment for improvements which have been made in the nature of buildings, etc.; the cost of the land being a minor consideration. In fact, except in the case of corner lots, it is probable that benefits and damages would be declared equal. For example, a lot 135 feet in depth fronting on a street eighty feet in width is undoubtedly worth more than one 150 feet in depth on a fifty foot street; particularly on one devoted to business.

To relieve the congestion in our business streets resulting from auto traffic and the parking of cars, various expedients have been introduced such as making certain streets "one way" streets; prohibiting the parking of cars except on one side of the street, and then only for a few minutes at a time; making straight traffic at important corners, etc. all of which are mere palliatives and do not furnish an effective remedy for the trouble. Apparently the only satisfactory solution of the problem is to widen the streets and the question is how can this be accomplished without placing a burden on the public treasuries too great to be borne or else increasing taxes to an intolerable extent.

The speaker wishes to present the following suggestion for the solution of the problem which, even though it may be found to be visionary and impracticable, he hopes it will stimulate the inventive faculty of some other member to find the correct answer.

The first step in the proposed plan is the obtaining from the legislature an act empowering municipalities to establish street lines and condemn land in anticipation of future needs; and permitting them to rent the land, thus sequestered, to the adjoining owners until such time as it may be deemed necessary for public use. In the carrying out of this program, the municipality would establish street lines of such width as it might deem necessary for future requirements, properly mark them by merestones or otherwise, and file a description of land taken in Town Clerk's office for record after which no encumbrances should be placed upon the land thus taken without the consent of the proper authorities, and then only with the agreement, on the part of the owner, that they would be removed, without expense to the municipality, whenever it was decided to remove all of the encroachments in the block in which said property was located.

In assessing benefits and damages, separate appraisals should be made for the land and for the structures thereon. Payment should be immediately made for the land but that for structures held in abeyance until the encroachments were ordered removed; the abutting owner, in the meantime, paying, to the municipality, an annual rental of (say) eight or ten per cent of the amount which he had received for the land; the difference between the rental charge and the interest on street widening bonds, on which money would be borrowed, to be used for the expenses of collection of rentals and for a sinking fund to retire the bonds when due.

The property owner should be allowed to keep his buildings in repair but not to add anything to their value. He should not be allowed to remodel or add anything to them outside of the established street lines, except as above provided. In case of a fire where walls suitable for use were left standing, their value for that purpose should be appraised, the owner paid therefor, and they should then be removed.

Whenever the municipality decided to complete the improvement, the existing structures should be re-appraised and the owners paid therefor, but, in no case, should such payment exceed the amount of the appraisal made when the street lines were established. In this way, sections of a street could be widened as opportunity offered, and the portions thus widened would offer a convenient space for the parking of automobiles without interfering with traffic.

As few buildings remain unchanged in a city for more than fifty years, especially on those streets which are changing from residential to business purposes, it would be only a question of time—and not a very long time either when measured by the life of a city—when the streets would be widened without much expense other than for the payment of land taken; "material progress," the "fire fiend" and the "tooth of time" all serving as efficient allies in promoting the end in view.

Two objections may be urged against this plan; first, as to its constitutionality, and, second, that it is too slow in operation.

As to the first, that is an open question, for, so far as I know, such a question has never been adjudicated. But the fact that many questions are decided by a five to four vote in the Supreme Court is evidence that the question of constitutionality and unconstitutionality has a mighty small "factor of safety." The further fact that any question which lies between public welfare and the rights of an individual is likely to be decided in favor of the former on the theory that public needs are paramount to private interests—the 18th amendment and the Volstead law, for example—leads me to think that the plan here proposed stands at least an even chance of being upheld; for, certainly, anyone witnessing present traffic conditions in the streets of most of our cities, would decide that public welfare required that some radical change should be made therein.

As to the second objection—slowness of operation—it is just as rapid as financial conditions and the wishes of the people determine. But, if slow, it is sure, and by this method wide streets would, eventually, be obtained at a reasonable cost. Under present methods, for two hundred and fifty years, more or less, our streets have been gradually growing narrower; it is time that the process was reversed.

The width which business streets of the future should have is a debatable question. Probably eighty feet would be a fair width for streets without trolley tracks; and ninety or one hundred feet would not be too wide for those with them. With sidewalks from twelve to fifteen feet in width, this would allow for parking cars alongside the curbs and still leave room enough for two way traffic.

MAINTENANCE GUARANTEES ON ROADS AND PAVEMENTS

Presented by Edward W. Bush before the Connecticut Society of Civil Engineers, February 22, 1922.

This paper is an argument against maintenance guarantees on roads and pavements because they are:

(1) unfair to the contractor,
(2) they reflect on the professional status of the engineer,
(3) and they are uneconomic for the public.

Before discussing the three points just mentioned, it is desirable to consider the various kinds of guarantees. The speaker during the past few years has reviewed a very large number of road and pavement contracts that have included a maintenance guarantee, and at one time was rash enough to think the guarantees could be classified, but they are of all kinds and description and apply to all kinds of roads and pavements from an ordinary gravel road up to an asphalt pavement of the highest type. The best the speaker can do in the way of classification is as follows:

(a) Guarantees against defective workmanship and materials.
(b) Guarantees against defective workmanship and materials, and defects arising from the use of the surface as a roadway.
(c) All other guarantees that exceed (a) and (b) in scope.

The speaker believes that all maintenance guarantees should be abolished, but if a guarantee is considered necessary, it should be strictly limited to a guarantee against defective workmanship and materials, as anything beyond this is an attempt to place a responsibility on the contractor that rightly belongs to someone else. However, it will be difficult to collect on a guarantee of this kind unless the construction work was not supervised or inspected. If engineers and inspectors supervised the job, they probably passed on the grade of materials and workmanship and it will be difficult to later claim that such supervision was incompetent. Engineers should choose which position they will take; either supervise the construction and have no guarantee, or have no supervision and hold the contractor responsible for the quality of workmanship and materials. It is ridiculous to attempt to occupy both positions, and, obviously the thing to do is to closely supervise and have no guarantee.

The second grade of guarantee is a little broader than the first because it also guarantees against defects arising from the use of the surface as a roadway. In other words it makes the contractor guarantee to the owner that the engineer knows his business. The contractor does not hire the engineer and had no part in determining the design of the road or pavement, so why hold him responsible for results. Another thing, no one knows what kind of a traffic our roads will be called upon to bear and what is a good design to-day may be hopelessly inadequate to carry the traffic two or three years hence.

In general, the third grade of guarantee makes the contractor maintain the pavement in perfect condition irrespective of the causes that produce the defects, or by specifically excluding certain causes and leaving the guarantee active on defects arising from all other causes. These guarantees are most unfair, and frequently it is specified that the pavement must be turned over at the end of the maintenance period in perfect condition.

The speaker has seen some contracts that clearly specified a class (a) guarantee in one place, a class (b) in another part of the same document, and elsewhere had a clause that had all the earmarks of having been drawn by the city attorney in which the contractor was clearly liable for everything, no matter what happened.

Coming back to the three reasons why guarantees are obnoxious that were mentioned at the beginning of this paper, the speaker believes enough has been said to prove that all maintenance guarantees are unfair to the contractor, unless he designs and supervises his own work, so we will pass to the next point which is that guarantees reflect on the status of the engineer.

Requiring a maintenance guarantee seems to indicate one or both of two things; the street or road commissioners distrust their engineer and believe he does not really know enough to design and supervise a good road or pavement; or the engineer doubts his own ability to design or supervise the work. Either case reflects on the professional status of the engineer.

The third point raised was that guarantees are uneconomic for the public. They are against public policy because they hire the contractor to carry a risk that can be carried more cheaply by the owner, although the latter no doubt believes he is getting something for nothing when a maintenance guarantee is specified. Surety companies do not like to write maintenance bonds because they never know whether the contractor will be in business and able to take care of the maintenance a few years hence. Guarantees make it difficult for some contractors to obtain bonds, therefore, the bidding is restricted. No one can tell what the traffic on any road will be a few years hence and the causes of a failure of the road might not be easily determined, while the contractor may make slight repairs rather than dispute the claim, he may with propriety take a different stand if the cost of the repairs runs to a considerable amount and the owner may have very hard work proving that the contractor is liable under the terms of the guarantee. Reputable contractors do not like to get into court and also avoid bidding in localities that have the reputation of trying to drive hard bargains with their contractors, places where they must perhaps sue in order to preserve their rights. Road guarantees are unfair, lead to disputes and are uneconomic, therefore should be abolished.

JOSEPH SEAVERNS GUPPY.

Joseph Seaverns Guppy, son of Benjamin W. and Edna S. Guppy, was born in Melrose, Mass., on December 17, 1894. He died at Cheshire, Conn., as the result of an auto accident October 30, 1920.

After attending the public schools of Melrose, Mass., and Portland, Maine, he completed his engineering education at Phillips-Andover Academy and Massachusetts Institute of Technology. He was first attached to the engineering department of the Boston & Maine Railroad in various capacities. At the termination of his service with the Boston and Maine Railroad, he was inspector in the office of Supervisor of Bridges and Buildings. In 1914 "Joe" entered the contracting field, being first connected with Fletcher & Lahey and in 1915 with the field engineering force of The H. Wales Lines Company, where he remained until the world war broke out.

On June 16, 1917, he enlisted as a private in the 14th Engineers; on June 24, 1917, he received a warrant as Master Engineer Junior Grade. On January 29, 1918, he received his commission as Second Lieutenant of Engineer's Reserve Corps. On April 6, 1918, he was transferred at his request to the infantry and on August 1, received his commission as First Lieutenant of Infantry. He was honorably discharged in February, 1919, when he re-entered the employ of The H. Wales Lines Company as engineer and estimator. "Joe" took part in the Cambrai Offensive, the Somme Defensive, the Aisne-Marne Offensive, the Meuse-Argonne Offensive and General Gourad's French army in Champagne. He received the Croix-de-Guerre for his work in the Aisne-Marne Offensive July 18, 1918, his citation reading, "For exceptional bravery in capturing a machine gun nest by storm." He killed four Germans and captured fifty-three prisoners. He was badly gassed in November, 1918, and nearly lost his eyesight. He spent eight weeks in the hospital.

"Joe" was descended from old fighting stock. The Guppys landed in Beverly, Mass., in 1720. One of his grandmothers, Caroline Reynolds, was a descendant of Ensign Enos Reynolds of Boxford, Mass., who fought in the French and Indian and Revolutionary Wars. Another one of his great-grandmothers was Mercy Warren, a relative of General Joseph Warren, who was killed at Bunker Hill. Two of his great-uncles, Charles and Langdon Guppy, served in the Civil War, and another relative, James J. Guppy of Wisconsin, was a Brigadier General in the same war.

Guppy was a member of the Colonial Club of Meriden, Conn., and also of Theta Delta Chi Fraternity. His death was untimely, and his friends and associates mourn.

George P. Barker.
E. B. Moss.
James A. Toner.

*LUTHER WHITE BURT.

Mem. Conn. Soc. C. E. Died January 21, 1921, in Hartford, Conn

Luther White Burt, a son of Richard Storrs and Maria Asenath (Boardman) Burt, was born in Hartford, Conn., October 16, 1848. He was a lineal descendant of Henry Burt, who came from England about 1630 and settled in Springfield, Mass., and, through his mother, of Samuel Boardman (or Boreman) of Banbury, England, who settled in Ipswich, Mass., about the same time.

He prepared for college at a private school conducted by Stiles French in New Haven, Conn. He took the engineering course in the Sheffield Scientific School graduating with the degree of Bachelor of Philosophy in 1871.

His professional experience covered a wide range of engineering work, including the Government survey of the Connecticut river under Theodore G. Ellis. His railroad experience comprised work on the Connecticut Western and the Charlestown, Chicago and Cincinnati railroads; the extension of the Central New England railroad from Tariffville, Conn., to Springfield, Mass.; and the layout and construction of a railroad for the Middlesex Quarry Company in Portland, Conn. In municipal engineering, he served as assistant and, later, as city surveyor of Hartford, Conn., and the planning and development of the town of Blacksburg, S. C. He also laid out and supervised construction of several state roads for the Connecticut Highway department. For several years he was engaged in the contracting branch of engineering during which time he constructed a part of the Gully Brook sewer in Hartford; several small sewers and the Sea street outlet sewer in New Haven, the largest sewer in that city; and a system of sewers for Danbury. He also, for a short time, served as engineer and superintendent of sewers in that city. In April, 1891, he was appointed city surveyor of Hartford, a position which he occupied for about three years, during which time a comprehensive topographical map of the city was prepared which provided the necessary data from which the city's sewerage system was planned.

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* Memoir prepared by Charles A. Ferry and Leon F. Peck.

After retiring from the office of city surveyor, he opened an office in Hartford for private practice, specializing in the determination and establishment of property lines, a work for which he was especially well fitted owing to his patience and painstaking thoroughness which are essential in harmonizing, from conflicting records, the facts necessary for determining the proper location of boundaries. In 1911 he was appointed a member of the Connecticut State Board of Civil Engineers, and, in this position, he passed upon the design and construction of several dams in the state, including those of the new water supply for the city of Hartford. In 1911, his son, Luther H. Burt, became associated with him in business under the firm name of L. W. Burt & Son.

He was a charter member of the Conn. Sec. C. E.; a member of the New England Water Works Association and a member of the Asylum Hill (Congregational) Church.

He was married twice; first, May 6, 1875, in Springfield, Mass., to Mary Alice, daughter of Albert Pownal Greene of Middletown, Conn. She died March 21, 1887, and, on January 23, 1895, he was married to Mary Rose, daughter of Samuel Halsey Francis, who survives him. He had five children by his first marriage; Luther Harold (B.S. Trinity, 1900); Alice Morgan; Marian Lucy, wife of F. Herbert Gile (M.D. Tufts, 1905); Richard Greene, who died at the age of four; and Daisy Helen who died in infancy. He had two children by his second marriage, both of whom are living; Arline Francis (Mrs. Howard C. Cole) and Charles Everett. Mr. Burt also left one sister, Lilla M. Burt of Hartford, and three grandchildren.

REPORT OF PROCEEDINGS

OF THE

THIRTY-EIGHTH ANNUAL MEETING

OF THE

Connecticut Society of Civil Engineers,

Incorporated

The thirty-eighth annual convention of the Connecticut Society of Civil Engineers, Inc., was called to order at 10:15 A. M., on Tuesday, February 21st, 1922, at the Mason Laboratory, New Haven, Connecticut, President J. Frederick Jackson in the chair.

SECRETARY KELLOGG: Mr. President, the minutes of the last meeting were accepted and printed in the annual report. The report of the Board of Direction was received and accepted, the report of the Secretary the same, and the report of the Treasurer also. The report of the Committee on Legislation was also read and ordered on file. Twenty members were elected to membership, and the officers elected appear on our program for to-day, yourself as President, Mr. Robert J. Ross of Hartford, First Vice-President, Alfred H. Terry, Bridgeport, Second Vice-President, Henry J. Kellogg, New Haven, Secretary and Treasurer. The directors were Thomas A. Scott, being the latest Ex-President, Robert A. Cairnes of Waterbury and Frederick L. Ford whose terms have not expired and Harold L. Blakeslee of New Haven, making up the full Board.

The address of the President was read, ordered on file and printed. The miscellaneous business, I do not know as there is any need of going over that. What was done was printed. So that will not be enumerated. The Committee on Amendment of the Constitution was appointed, and that committee has been at work during the year. The papers delivered are printed in the annual report, or will be in connection with the report that we hope to print this year. The meeting was adjourned and finally closed on February 16th at 1:30 P. M.

Minutes accepted.

THE PRESIDENT: The next is the report of the Board of Direction.

SECRETARY KELLOGG: "The Board of Direction held several meetings during 1921, and except at the meeting in Waterbury, when the Society went to inspect the work on the Shepaug Dam, were well attended. The meeting prior to the summer outing held at the Graduates' Club in New Haven found every member present. The spring meeting and the January meeting were each lacking only one of the full Board. Three of the meetings, April, June and January, were held at the Graduates' Club where the Board was entertained at luncheon by President Jackson. At the June meeting, the Board voted to allow the Treasurer to solicit subscriptions to replenish the funds of the Society and at the Waterbury meeting, in the Chase Building, it was voted to omit the publication of the Annual Report as the Treasurer showed that there was not money enough on hand or in sight to meet the expenses.

The drive for additional money to replenish the Treasury turned out to be a failure as only $167.00 was raised. The individual subscriptions ran from $1.00 to $25.00, a very good range but lacking in number of subscribers.

Applications to the number of 15 were approved by the Board at the meeting held at Double Beach.

Minutes accepted.

The next is the report of the Secretary.

SECRETARY KELLOGG: Mr. President and Gentlemen: This last year has established a record in the activities of the Society. More meetings were held than in any year since the first organization of the Society. The first one was in May at the New Haven Gas Light Company's meeting room where Dr. Britton gave us an illustrated lecture on mosquitoes. That may not strike one at first blush as being a subject allied to engineering, but when we consider that an engineer may be called upon to handle drainage problems to limit the breeding waters, it brings the subject directly to us.

Dr. Britton by words and pictures showed how the pest propagates, and how to limit their output. It was an hour of interest, and we must regret that more were not present to be informed of what happens in the still, shallow waters of wet meadows and puddles that exist long enough to give a mosquito time to get its full growth. The yellow fever spreader does not interest us northerners vitally, but the malaria carriers and the common every warm day and evening marauders, culex, are here in Connecticut. The anopheles, malaria, is an evening visitor as a rule, but culex and anopheles sing apparently the same tune and produce the same itching and profanity, and are sleep-and-front-porch-comfort-destroyers. At that meeting, Professor C. F. Scott urged us to join in the work of improving the condition of the Engineers of America by joining in the work being done by the American Association, and the Federal Societies.

The summer meeting, at Double Beach, was a greater success than the committee expected. 167 members attended. The weather was fine for a field day and candidates for athletic honors were plenty. Hartford won the ball game by a close score and it was a good game, especially considering the grounds. I hope to see an engineer's game on full field area, and well groomed infield. We had dashes of limited distances. Potato race, jumping, and balloon races. The balloon race was put on with inflated paper bags as it was impossible to get the small balloons. As the aforesaid Secretary won the broad spit, not many years ago at North Branford, he was the favored in his own opinion, but Charles E. Price got the better of him. Candidates for the 200 lbs. foot race were not all quite up to weight, but there was no protest. The canoe tilting match was a bit unequal as the canoes were not well matched. The swimmers struggled bravely to win in their events. The prizes were all worth winning.

The dinner at the Double Beach House was somewhat delayed, as more attended (they kept arriving) than were expected and extra seating had to be provided. But it was a good dinner, good music and good singing.

At Waterbury, we had the trip to Shepaug River, then a supper at Waterbury and a lecture there in the Chase Building on gathering asphalt at the lake, with pictures. The paper is printed on page 70 of this Report.

We had a visit to Stamford where we were shown the sewage disposal plant by City Engineer Paul Nash, who will give you a paper at this meeting on the Stamford Sewerage System.

We were also taken through the extension plant of the Yale & Towne Company which was so extensive that the peregrinations called to mind the lines of a very old song of the balmy days of walking matches: "And she talked a thousand quarter miles in a thousand quarter hours." Mr. Maxwell W. Maxwell followed up the inspection by an interesting talk on the methods that had been used to gain the efficiency for which that manufacturing company is noted. At the dinner, that evening, Mr. Edward Everit read a paper on the work of the Telephone Company that we hope will appear in the report. Mr. Everit, Chief Engineer of the Company, is well equipped with knowledge to deal with his subject and it will be an interesting paper to publish. We went to Hartford to see the new building and its modern equipment of the Hartford Electric Lighting Company. It is a mammoth structure on the banks of the Connecticut River, and it was enough to make one leg weary and give one brain fag to get through the inspection. A first class dinner followed at the University Club and then we went to the lecture room of the above Company and listened to an interesting and instructive talk on motor transportation.

At New London, last fall, we went out on the new State Highway that had been nearly completed by C. W. Blakeslee & Sons, a cement concrete pavement that connects Hartford and New London. We were given an opportunity to get the last word on cement construction for big highways. Our dinner was at Smiling Jim O'Leary's. Mr. James E. Barlow met us at the Chamber of Commerce Hall, and explained how a City Manager managed and put that form of handling the city work, the construction and maintenance work, in a most favorable light. He was followed by Mr James Hammond, Secretary of the Chamber of Commerce, who ably endorsed what Mr. Barlow had said and gave interesting additions of his own to the subject.

President Jackson has given us a big year. When he first gave me an outline of what he intended to do, I thought he was biting off a very large chunk, but he managed to chew it.

Mr. E. Irwin Rudd has worked with his committee on meetings most diligently and well. No one, perhaps excepting the President, knows what a lot he has done during the past year and done well.

Mr. L. J. Carmalt with his Committee on Papers has gathered for us a fine list for our program. J. P. Wadhams, Committee on Membership, has brought in many new men. The different committees and their personnel will appear in the next report. Except the committees on meetings and papers, the various committees had little to do, but they were all on their jobs even if they gathered lean harvests.

Your program to-day presents more features than ever appeared before. Mr. Jackson was evidently bound to give us more than one man can do in two days. The situation recalls the time when I played King Artaxominous in "Bombastes Furioso," a college affair. In my lines was this:

"So when two feasts whereat there's naught to pay
Fall unpropitious on the self-same day
The anxious Cit each invitation views
And puzzles which to take and which refuse.
To stay away from this or that is loath
And sighs to think he cannot dine at both."

Your dinings in this case are easily enough managed; but there are more educational feasts than one can get to. So make your choice.

There are seven deaths to report: C. M. Jarvis, L. W. Burt, Prof. John E. Clark, J. S. Guppy, W. H. Moore, F. S. Wardwell and Winthrop Bushnell. The memoirs have been presented for Burt, Guppy, Moore and Wardwell. Those for Clark, Jarvis and Bushnell will be obtained by the Secretary.

So in concluding this report, let me say I hope we can come together to-morrow evening to what may be called the end of a nearly perfect year. (Applause.)

The President: You have heard the report of the Secretary. What action will you take?

Mr. Turner: I move that the report of the Secretary be accepted and ordered on file.

Carried.

The next is the report of the Treasurer.

Treasurer Kellogg: The balance last year, February 1st, 1921, was $84.55. We have received from dues $1,433.24. That is for 1917, 4-$4.00 1918, 9-$9.00. 1919, 36-$36.00. 1920, 136-$136.00. 1921, 1924, $1,236.24. 1922, 12-$12, or a total of $1,433.24. Dinners and lunches $874.50. Note on bonds, $439.15. Coupons, $19.87. Advertisements, $322.80. Donations, $167.00. Personal note, H. J. K. (me) $75.00. Over advance by H. J. K., $14.72. Total, $3,430.83.

EXPENDITURES.

Postage	$ 92.09
Town Clerk	1.00
New Haven Printing Co.	249.25
Clerk hire	5.00
Sheet music	4.00
Hotel Taft dinner, etc.	79.50
Pictures at Taft	30.73
Mason Laboratory	10.00
Orchestra, Taft and Double Beach	49.00

Vaudeville singers, Taft	$ 10.00
Song leader, Taft	5.00
Stenographer, annual meeting	151.70
May Smoker	27.73
Telephone and telegrams	5.05
Double Beach Hotel dinner	350.00
Typewriting	8.00
P. O. Box	8.00
Cigars, Double Beach	10.20
Baseballs, Double Beach	5.00
Prizes, Double Beach	18.61
Safe Deposit Box	5.00
Badges	12.00
Expenses, Secretary	10.00
Return of application fee	4.00
The Tuttle, Morehouse & Taylor Co.	1,362.69
Secretary	400.00
Balance in bank	107.83

THE PRESIDENT: You have heard the report of the Treasurer. What action will you take?

Report accepted.

SECRETARY KELLOGG: Mr. President, there is a little addenda to that report that I think I should put in, if you do not mind. We had on hand a year ago, $84.55. Deposits, $3,287.56. Personal note, $75.00. That made the total, February 1st, 1922, for the year, $3,447.11. Taking out that balance of $187.03 and it shows expenditures of $3,339.28. We have for assets $500.00. Liberty Bonds worth, face value, $500.00, but actually $490.00. Cash in bank $107.83, or a total of $597.83. Taking the note to be paid of $450.00 and the New Haven Printing Company's bill of $71.91, makes a total of $521.91, or a balance in our favor of $71.93.

THE PRESIDENT: The next in regular order is the report of the Committee on Revision of the Constitution.

MR. TURNER: Mr. Chairman, I do not know why I should have been selected to head this Committee. I think my sentiments towards the amendment of any constitution are too well known to require any speech upon my part, but nevertheless, I am willing to take full responsibility for that action.

When the committee came to discuss the questions that were before it, we found that we had three different opinions by three different members on the committee, and it was very difficult to harmonize the situation, and we gave up all chance of it. There was no one, however, that was very seriously at fault in any way. The following changes are recommended by the committee. (Laid on table temporarily.)

THE PRESIDENT: Gentlemen, you have heard the report of the Committee on Revision of the Constitution. The Constitution provides that any proposed amendment be presented in writing, signed by three members, discussed, and then if the action of the meeting is favorable, it is taken up again.

The next report is the Committee on Meetings.

Mr. Rudd's Report.

The Committee on Meetings begs to report that during the past year there have been held six meetings which have been well attended by the members.

On May 23d at New Haven, in the Gas Company's Building, there were about 40 present at the evening session where we were addressed by Dr. W. E. Britton, State Entomologist, on "Mosquito Extermination," illustrated with lantern slides; which proved very interesting and instructive to all present. The outstanding feature of this lecture was the fact that in order to drain land for mosquito extermination purposes it is not necessary to have a ditch to drain out water but rather one to drain in water so as to get a change of water daily. Buffet lunch of sandwiches and coffee was served and the gathering broke up with enthusiastic cheers for the success of the monthly meeting idea.

On August 9th, the regular summer meeting was held at Double Beach, with an attendance of about 165 at dinner, a large number of whom took part in the sports which preceded the feast. The outstanding features were the fat men's race and the balloon race; the baseball game was closely fought and resulted in a victory for the Hartford contingent. Amusement was furnished by the canoe jousting when Charlie Price tried to splash all the water out of the Sound.

On October 10th, about 50 members met at the City Hall, Waterbury, for an automobile trip to the Shepaug Water Supply, under guidance of Mr. Cairns, which proved an interesting and instructive ride, made all the more enjoyable because of the gorgeous coloring of the autumn woods. Supper at Mrs. Thorpe's Tea Room preceded the evening meeting at the Chase Office Building. Mr. J. S. Miller, Chief Chemist of the Barber Asphalt Paving Company, speaking on "Asphalt" enlightened us as to a few of the multitudinous uses of the bitumens. To hear him tell it we may expect to almost live on asphaltic compounds.

This meeting was followed on November 7th by an afternoon trip to the concreting plant of the C. W. Blakeslee & Sons Company near New London, to inspect modern methods in highway construction, and in the evening at the Chamber of Commerce rooms in New London; Mr. J. E. Barlow, City Manager, explained to us a few of the trials and tribulations of such a position, at the same time almost convincing us that we should have an Engineer Manager for all our cities and towns. Mr. J. G. Hammond, Secretary of the New London Chamber of Commerce, then explained to us how the Commission Manager form of government was sold to the City of New London. His exposè of how New London happened to vote for a City Manager teaches all of us that when we advocate the establishment of this form of government for any of our communities we should painstakingly sell the idea to the few men who appear to be most interested in keeping the established government in existence. About 45 men attended this New London meeting and we all supped together at O'Leary's.

Stamford entertained us next on December 5th. We had our pictures taken on the City Hall steps (and by the way Photographer L. Deran of

No. 133 Atlantic Street, would like to dispose of some more of the pictures.) Mr. Nash conducted us over that sewage disposal plant, which he expects to explain to this meeting, and then 65 strong, we visited the manufacturing establishment of Yale & Towne, where we were rapidly shot from one department to another, winding up in the "apprentice school" for instruction by Maxwell C. Maxwell, the General Superintendent, on "The Relation of the Engineer to the Manufacturing Industry," exhibiting the dependence of the Yale & Towne organization upon the engineers (called superintendents) who head each of its departments. The Suburban Club served 55 for dinner, after which Mr. E. H. Everit talked to us about "The Methods of Communication as Related to Business" incidentally stating his belief that the field of the wireless was in supplementing rather than supplanting the telephone and telegraph.

In January, on Friday the 13th, a lucky day, we assembled in Hartford and visited the new steam-electric plant of the Hartford Electric Light Company, and from the roof of the station viewed Hartford's industrial center of the future on the great South Meadows, Mr. Ross, our Vice-President, enthusiastically painting the word picture. The City Engineer's office was visited where a thorough inspection was made of the method and manner of operating this important department of the City Government, including a tour of the Municipal Building; and then a short side trip to the old State House, before 55 of us hurried to the University Club for dinner. In the evening at the office building of the Hartford Electric Light Company, Mr. R. L. French, Traffic Manager of the Graphophone Company of Bridgeport, talked to us about "Traffic Kinks" and, to our great surprise, we were informed that a traffic manager is in a position to save large amounts of money for his company through his knowledge of freight classification, short line routes and choice of transportation unit, as well as in determining methods of packing the product.

The annual meeting in New Haven you are now enjoying and upon which you will pass your own verdict. In view of the marked success of the monthly meetings the Committee suggests that they be continued and offers for the consideration of their successors: Bridgeport, March 20th, New Britain, April 12th.

Thanks are here extended to all members who have helped make these meetings a success.

Respectfully submitted,

Committee on Meetings

E. Irvine Rudd, *Chairman*,
P. N. Wilson,
C. J. H. Holbrook,
J. T. Henderson,
C. R. Darrow,
P. A. Merian,
Oliver Gildersleeve,
H. D. Pomeroy,
A. L. Donnelly,
Robert Hosley,
H. Bein,
M. A. Connor,
William H. Hull,
Max Unkelbach,
William H. Arthur,
Frank Bachman,
T. R. Sucher,
B. D. Pierce, Jr.,
J. Randle,
W. L. Ulrich,
C. H. Preston,
Aubrey D. Fuller,
Paul Nash.

Report accepted.

COMMITTEE ON MEMBERSHIP.

MR. WADHAMS: Mr. J. P. Wadhams. Mr. Chairman, I have not very much to say. The number is not quite as high as in previous years, and the membership committee does not take all the credit of these new members. Also we have not gotten as many as we should have liked, still the aggregation for the year is 19 new applications. Waterbury is the only large place that is not represented by the work of the membership committee. I do not know whether that means anything or not. We made a special drive before each meeting to line up new members, and the committee has been working individually all through the year. I think that is about all I can say about it. Our work is shown by the list.

Report accepted.

REPORT OF THE COMMITTEE ON PUBLIC RELATIONS.

PROF. JOHN C. TRACY: Last spring, among the committees appointed to carry on the work of the Society during the year, was one on Public Relations. It is becoming a recognized fact that engineers have not in the past taken part in public affairs, as engineers, to the extent that might be desirable, and it was the idea of your committee that it was formed to devise means by which this Society could render real service to the community, making such suggestions to the Board of Direction for action as might seem desirable.

Rather to our surprise it was found somewhat difficult to lay down a line of action we were willing to recommend. It did not prove practicable to get many of the members of the Committee together, and the results of correspondence were not encouraging for the accomplishment of what we had hoped for.

An attempt to influence public opinion would require, in order to be successful, to have back of it the support of the Society as such and your Committee of course could not act for the Society. An attempt merely to set up the facts without argument would not be of great assistance and would lead possibly to inquiries as to our position, which would not be properly answered without committing the Society, and would very likely be construed in any event as a definite stand for one side or the other.

It has also been suggested that your Committee might gather together facts and submit to the membership with recommendations so that vote might be taken as to the position the Society should assume. Such a course as this would require so much time that generally any actions taken would be so late as to be of little use or assistance.

In a committee handling this character of work, it is especially true that its accomplishments depend to a very considerable extent on its Chairman, and in this respect your Committee has unfortunately been weak.

There is a real field here for good work to be done and opportunity to render valuable service, a goal for which every man, whether an engineer or not, strives.

For the Committee,

WILLIAM T. DORRANCE, *Chairman.*

COMMITTEE.

Prof. John C. Tracy, 345 Winthrop Ave., New Haven, Conn.
Mr. C. M. Saville, Chief Engineer, Board of Water Commissioners, 1026 Main Street, Hartford, Conn.
Mr. E. O. Goss, 117 Pine Street, Waterbury, Conn.
Prof. C. S. Farnham, 211 Norton Street, New Haven, Conn.
Mr. F. J. Pitcher, 81 Woodbridge Street, New Haven, Conn.
Mr. H. I. Skliton, 103 Allen Place, Hartford, Conn.
Mr. C. N. Chandler, 161 Main Street, Norwich, Conn.
Mr. Charles A. Ferry, 82 Church Street, New Haven, Conn.
Mr. S. P. Senior, 820 Main Street, Bridgeport, Conn.
Mr. Leon F. Peck, Superintendent of Streets, Hartford, Conn.
Mr. W. T. Dorrance, Railroad Building, New Haven, Conn.

Report accepted.

THE PRESIDENT: Report of the Committee on Affiliations. I do not see the chairman of that committee here. Mr. Patience, I believe, is a member. I do not see any other member of the committee here. I think Mr. Trowbridge was here. I might say for Mr. Bush that when I made up the list of appointments, he did not know whether he would be able to act on the committee, but he finally accepted it with the understanding that he would do what he could. I have mentioned this matter in my own report which will be presented to you later on and I think, possibly that will cover the report for this committee. So unless there is some question about it, we will pass on and call for the report of the Committee on Papers.

MR. CARMALT: The report of that Committee on Papers is practically shown by the program for this annual meeting which is before you, and of which, I presume, you all have copies. Owing to the commercial occupations of the Committee on Meetings, it has not been possible for the members to confer quite as often as perhaps was desirable, but the committee has always stood ready to assist in securing papers in case of any trouble, and especially in securing papers for the annual meeting. It has been our aim to have not only attractive technical papers, but also to obtain and to give you the benefit of the ideas and experience of men of national reputation in the engineering profession, so far as we could. In that connection I want to call your especial attention to papers which have been secured for afternoon and evening, where we have in one case a representative of the American Telegraph and Telephone Company, who has been connected with and had a very broad experience particularly with the national work of that Company. In the paper which is to be given this evening by Mr. Davies, who is the Civil Engineer of his organization, and who has had a very broad experience in connection with the construction of underground tunnels. He is a man of not only national but international reputation. I think our Society is to be congratulated in securing men of that type to appear before us.

Report accepted.

THE PRESIDENT: The next matter on the program is the report of the Committee on Publications by Mr. Alexander S. Lynch.

Mr. Lynch: Members of the Society: The Committee on Publications met rather late. I found that four members of the Committee lived in Massachusetts, and three in Connecticut, and so in order to find out just what to do, I went to that fountain of wisdom, who has presided at the City Hall for many years, our Secretary, and I asked him what I should do. He told me to go up to the Taft and engage rooms to make provision for each member of the Committee from Massachusetts, and then he said "you make arrangements for a dinner for eight." There are eight on the committee. Have that dinner in some secluded dining-room and he said, "you are a young fellow, and you should procure a bottle of Scotch with other fixings for each plate, and just let it be known what you are going to do, and I never knew of such a dinner to fail." Well, I went up to the Taft, but they would not let me make my arrangements there. I found I could get a room at the Garde and I came back and reported my progress to the Secretary.

Mr. Lynch: Well, then I wrote to them. The answers which I received were not any too encouraging. One up in Massachusetts was sick, and his daughter answered for him, saying that her father had been laid up and was not taking any interest in business matters; but three members, Mr. Brown, Mr. Nettleton, and myself, met and discussed the thing in full. Also Mr. Ward. We had at the time, statements of the Secretary to the effect that this year's publication had been omitted primarily on account of the lack of funds. With this difficulty confronting us, it seemed rather out of the question to consider, at this time, any publication for the Society. However, the opinion of the members of the committee expressed, either at the meeting, or by letter, was to the effect that the next annual publication should not be omitted except in the case of dire necessity. It is the opinion of the majority of the committee that the annual publication was most valuable, particularly through our exchanges. The cost of issuing the year book has been about $1,500 each year. This is, of course, a rather large amount for the Society to pay, because its sole source of revenue comes from its 500 members. The totals received should be around $2,000 and to spend three-fourths of this amount on one publication is a serious undertaking. There is a small source of revenue from advertising contained in the annual publication, but this does not sufficiently offset its cost. Your committee is, however, strongly of the opinion that ways and means should be devised for continuing the publication of the transactions of the Society. Your committee felt that in the face of the shortage of money, the only thing that your committee could do was to recommend that the year book should not be omitted, no matter what the reason was, if it could possibly be avoided, and that before it was omitted, it should be submitted to a vote of the entire membership and let them decide.

The question of issuing a quarterly paper in magazine form was also considered. It is possible to issue a quarterly publication containing all the news of interest, both technical and otherwise, to the members. This publication could be made, in the opinion of some of the members of the committee, self-supporting. There are to-day several houses which make a business of publishing trade journals and society magazines. In fact, in the West and in the South, we have found that practically every State has what is called a municipal bulletin; that is, published by the coöperation of different cities. For instance, in Missouri, a number of cities have combined to get out what they call the monthly bulletin, and one city finds something which is of interest, and then instead of confining its use to that particular locality, there is a description published of it in this bulletin, and it immediately becomes public property all over the State. In that way this paper acts as a medium through which much good results. In that way a good many good ideas can be put before Engineers and people who are allied with Engineers in their work. There are in New Haven, to-day, two or three reputable houses, who make a business of publishing trade journals, church papers and society magazines, and they publish them in the name of the particular society for which they work. All of the advertising in the magazines so published, is submitted to the society for censuring. Articles which are published are provided by the members of the society and they are of course all right. The paper is published by the society and so comes under the protection of the society in question. These papers can be subscribed for by the members of the society at from 50¢ to $1.00 a year. That provides revenue and at the same time leaves the journal as the property of the society, and the cost of publication, mailing, etc. is borne by the house which does the publishing. I have forgotten whether that suggestion is incorporated in our record, but I offer it to the Society for what it is worth. The only question that has been raised about it, or the only objection is, whether or not it is ethical for the Connecticut Society to lend its name to the issuance of a publication which is not wholly and absolutely a part of our provisions themselves.

Referring to our report, the way this is handled in some instances is, the society vouches for the publication and permits the publication in its name. All news and advertising matter is submitted to the society, or to some officer of it designated by the society as editor, before it is permitted to be published. In this way all the matter contained in the magazine is subject to careful scrutiny before going to the publishers. The magazine so published is issued to the members of the society and others interested at a nominal subscription price, the advertising contained in the magazine paying the entire cost of publication.

As I have already suggested in what I have said, the serious question arising is one of ethics, whether or not it would be quite ethical for the society to lend its name to a publication which is not absolutely and entirely of the society itself. That, however, is one which is not insurmountable, because in any publication of this kind, as before stated, all the matter is submitted to an officer in the society before publication, so that the society may put its stamp of approval on all the matters contained therein.

Some of the members of the committee felt that unless it could be shown that the year book was of real value to the society, it should be dispensed with, resulting, of course, in considerable saving to the society. This can only be determined by a vote and your committee recommends that this question be submitted to the entire society by letter.

As so stated, in the beginning of this report, it is the opinion of the committee, however, that the year book is most valuable, a real credit to the society and that it is a serious loss to the prestige of the society to stop its publication. The committee feel, and strongly feel, that the omission even of a single issue of our annual year book is a great mistake.

Report accepted.

The President: We have one standing committee which has been in charge of matters of legislation in which the society is interested for several years back. Mr. Buck, I believe, is in charge of that. We should like a report from that committee.

Mr. Buck: In connection with what I might say about this committee, Mr. Chairman, I should be glad to hear that our year book was not going to be published for I should not want what I am likely to say about the last legislature to be printed. (Laughter.)

The principal activity of the Legislative Committee was connected with the bill for the licensing of Engineers. The American Association started a movement for the licensing of Engineers and we were asked to co-operate with the various societies, and secondly, a bill for that purpose was prepared and submitted to the General Assembly. The first draft of the bill was submitted to the house. It was not quite completed and Mr. Smith of the Association ascertained that no further action would be taken by the Committee on the Judiciary, to which committee the bill was referred, until there had been a chance to make some amendments to it. Quite a large number of the different committees of the Society were held and the bill was finally got in the shape, which we desired it to be, in putting the licensing proposition into effect. But just before that was ready for submission and before any other work had been done, the committee called a hearing. The hearing held was very brief. The committee was jammed with work. There had not been any opportunity to see any member of the committee beforehand, so that they had no interest in the bill when it came up. They called for testimony for the bill which had been submitted. Some fifteen engineers which were present spoke in favor of the amended bill, but the bill was unfavorably recommended. I think the reason that there was not more of a show was, first, because the work had not been started early enough, and secondly, our bill had not been properly advertised, especially with the committee of the legislature. I think there is a demand for such legislation from our entire membership, but I think that the legislative committee ought to have some one at its head like Mr. Ford, who knows practically everyone up at the Capitol, to guide the machinery and start the thing.

And another matter that the legislative committee was interested in reminds me a good deal of those who have seen a big boy who sometimes picks on a small boy, or on one of his little chums, and thus every little while making life miserable. The legislature had before it at the last session, a bill which had been prepared by Dr. Black of the Health Department. As the bill was introduced, he attempted to see to it that everybody that was practicing medicine in the State had a proper license based on some examination before practicing in Connecticut. The members of the legislature and who were from these towns raised a cry that Dr. Black was a czar, and was attempting to run things in his own way, and the result of it was to create a strong sentiment at the Capitol in opposition to the Board of Health. The bill had a good many points about it, but the cry that was raised was enough to defeat it. So you can see how things go.

The Legislative Committee appeared at the hearing with regard to the disposal of factory waste. I personally was very much disappointed to see the attitude which was taken towards the Board of Health in regard to that matter, because I am personally sure that the Commission, and the said Board of Health, has been doing splendid work here in our State, but the Board is not being supported by a large appropriation as it should be.

That work has too much of value in it to be sidetracked. The factory waste commission worked at it, but their work is now entirely shut down, and the commission which was created to carry on their work has not been provided with necessary funds, and has not been able to get any since. So nothing has been done to continue, or even to publish the most excellent work which was done at New Britain and other places along this line. That is a thing which engineers should be interested in and I think that we should be able to take an active stand in regard to that matter when it comes up again.

I think that the present legislative committee should be allowed to retire at this time. This is an off year when there is no legislature in session. There is nothing pressing at this time and I think a new legislative committee should be elected to contain a personnel which will function properly and which will begin to lay its work and get it in shape before our next annual meeting.

Report accepted.

Chairman of Tellers: Total number of votes cast, 153. For President, Robert J. Ross has 151. Two blanks. For 1st Vice, Alfred H. Terry of Bridgeport has 150. Scattering three. For 2d Vice-President, Clarence M. Blair has 146. Scattering 4. For Secretary and Treasurer, Henry J. Kellogg of New Haven has 144. Scattering 9. For member of the Board of Direction, Vincent B. Clarke has 141. Scattering 11.

The President: The report of the tellers having been announced, I declare elected as officers for the ensuing year:

Robert J. Ross, *President.*
Alfred H. Terry, *Vice President.*
C. M. Blair, *Second Vice President.*
Henry J. Kellogg, *Secretary and Treasurer,* and
Vincent B. Clark to the Board of Direction.

I believe at this time it is customary to call upon the newly elected president for a few remarks.

Mr. Ross: Mr. Chairman, I had no idea that I would be elected president, so I have no talk prepared. Anyway, Henry Kellogg told me that in case I ran and was elected and had anything to say he did not want to listen to it twice. (Laughter.)

Of course, the President is not really president anyway, until after the adjournment of this meeting. It says so in the constitution and so far as I know, the Committee on Revision of the Constitution did not recommend any changes in that respect.

Of course, I feel the great honor which you have done me. I appreciate being president of this Society. It is surprising to me how easy it is to be president. Really the only time that you need to work, or have your friends work for you, is when you are running for Second Vice. If you get 10 members to stand for you that puts you on the ballot, and if you once get on the ballot, even if you happen to be the only one nominated, the society is made up of such a kind, gentlemanly crowd, they follow you up until they land you in the president's chair. So if any of you has any idea that you would like to be president of the society, the time for you to do a little good work is when you are running for Second Vice. Anyway, there's one good thing about this, and that is, we are not asked to file a bill or a statement of campaign expenses. I would be almost ashamed to file mine, because really I haven't spent a nickel. I haven't even bought a cigar although I am grateful enough, if there is any of you who hasn't smoked and they will be good enough to tell me, I will ge glad to buy for the crowd. (Laughter.)

MR. WADHAMS: Mr. Chairman, I don't wish to interrupt the current of business, but I just wanted to inquire whether the new members have been elected.

THE PRESIDENT: It seems to me that all that is necessary is that this meeting should instruct the Secretary to cast one ballot each for active and associate members, for these men as new members.

So voted.

So empowered, the Secretary cast one ballot for James E. Barlow Eric W. Benedict, John J. Brady, George E. Browne, Harry B. Bussing, Robert W. Clark, Walter E. Colby, Allan D. Colvin, Truman J. Curry, Jr., Joseph Doman, Howard W. Fritz, Howard G. Husted, Ralph B. Kirchberger, John B. Lauper, Philip G. Laurson, Douglass G. Little, Bronson E. Lockwood, Harvey B. McCrone, George N. McDonald, Frank J. Monaghan, Louis M. Petrucelli, Louis F. Quirk, Charles P. Richmond, Charles A. Root, Francis H. Scott-Smith, Herbert Scott-Smith, L. Theodore Scott-Smith, Frank P. Stabell, Louis P. Stein, Ralph A. Wheeler, Henry C. Whitlock, William J. Wood, active, and Howard W. Fritz, associate.

(Mr. J. Frederick Jackson read his address, as President.)

THE PRESIDENT: The next order of business is "amendments to the by-laws." The proposed amendments have been printed on the last page of the circular, or the program which has been distributed among you. Due to the fact that there was some misunderstanding there was one other motion which was admitted which the Chairman of the committee called to your attention. I think it may be properly considered at this time. The amendment as it stands provides for striking out by-law No. 1. "In addition to the regular annual meeting, as provided by the constitution, the Society shall hold at least one other general meeting, and may hold such other meetings to listen to lectures or addresses, or to visit engineering works of interest, or of a purely social nature as the Board of Direction may decide to call." In place of that it is proposed to substitute this: "In addition to the regular annual meeting as provided by the constitution, the Society shall hold at least one other general meeting, and may hold such other meetings as may be called by the President for the presentation of papers, lectures or addresses for visiting engineering works of interest, or for purely social purposes."

So voted.

Mr. Turner: The other matter which the President has referred to relates to Article 4 of the by-laws which is manifestly obsolete. The first I knew of this matter was through a letter called to my attention by another member of the committee. I will read Article 4. "Contributing members under the old constitution shall become associate members upon the adoption of the revised constitution." We have no such thing. It should be cut out by a vote of this meeting.

So voted.

Mr. Bush: If it is your pleasure, we will now take up the report of the Committee on Constitution and By-Laws which was laid on the table.

So voted.

The President: What is your pleasure to do with it? Will you take it up article by article? If so, I will read it. Article I, Section 2, line six, strike out the words "or to hear" and in their place substitute "and the hearing" so that the article as it will read when it is corrected, "the object of this society shall be the professional improvement of its members; the encouragement of social intercourse among men of practical science, and the advancement of engineering in its several branches, to wit: civil, hydraulic, naval, sanitary, mechanical, electrical, architectural, mining, geological, metallurgical and chemical; the reading and discussion of papers, and the hearing of lectures on any of the above topics relating to engineering, science, and the transaction of all business properly belonging to said society."

So voted.

Approved.

Article III, Section 6. Strike out the last sentence as it now stands. "The Board of Direction shall audit the treasurer's accounts and books annually." Substitute in place of that language, "books shall be audited by Auditors appointed by the society at its annual meeting." I think that is plain.

Approved.

Article IV, Section 1. Voted to change to read: At each annual meeting the society shall elect by ballot a president, a vice-president, second vice-president, a secretary and a treasurer to serve one year and a director to serve three years.

The President: The next in order is as to Article IV, Section 3. Strike out the words, "twenty-one" insert the word "ten." I think the chairman of the committee has explained the reason for that. Practically it has been found impossible to get this out twenty-one days before the annual meeting. This Section provides that at least twenty-one days before the annual meeting, the Secretary shall send each member a ballot containing the names of candidates for office. As I said, it has been found almost impossible twenty-one days before. What is your pleasure to do with that?

The President: It is regularly moved and seconded that the recommendation be approved and submitted to the Society by letter ballot. Will you discuss the matter?

Mr. Wadhams: Ten days, it seems to me, is a pretty short time in which to get that letter out and get it back again. It seems to me that members in remote parts of the State of Connecticut might not have any opportunity to vote under that.

The Secretary: Mr. President, I want to say that Mr. Jackson and I have had about twenty years of experience, and it has never been done yet in the twenty-one days.

A Member: Mr. President, couldn't this matter be explained a little more thoroughly? There are some of us here who do not quite understand what the significance of this proposed change is.

The President: Originally,—shall I read Section 2 of that Article, as it was for the benefit of those who may wish?

A Member: Just explain the point of it.

The President: Well, originally Section 2 provided that nominating blanks should be sent out by the Secretary to each member at least sixty days before the day of the annual meeting. And that the nominations for officers should be returned to the Secretary in an envelope endorsed with the member's signature within twenty-one days from the date upon which the blanks were mailed to members. This also provides that these envelopes shall be delivered by the Secretary unopened, to the Board of Direction at a meeting to be held by them to canvass such nominations. Of course that was to fix the date at which nominations could be made. Then we have the Section that we are now considering, Article IV, Section 3, which says that at least twenty-one days before the annual meeting the Secretary shall send each member a ballot containing the names of the candidates. Now if this change is voted which is proposed, it will read ten days at least before the annual meeting instead of twenty-one days. Does that make the matter clear?

Mr. Price: It seems to me, Mr. Chairman, that it would be a mistake to make that ten days, and for this reason. In my travels throughout the State of Connecticut, I had more inquiries as to when the Society was going to hold its meeting than of anything else. Of course you all know, if you have stopped to think about it, that it should be on the third Tuesday in February. I believe that is the provision. But many of us, in the hurry of our daily duties, do not remember that provision. In fact, I was not aware myself that the Constitution said that the meeting was to be held on the third Tuesday in February. Now, I think there are a number of our members, business men, who cannot get here to-day, for the simple reason that they had no knowledge that the meeting was to be held until they received the notice to that effect. Now it seems to me that for the same reason, it would be unwise to make that ten days. That is a very short time. Some might be away, and some might want to take a little time for consultation with other members and I am afraid it might operate badly.

Mr. Wadhams: I should like to inquire, Mr. Chairman, as a matter of information, whether if technically, these ballots are not out in twenty-one days, the ballots are invalidated, provided a person wanted to make a point of that. If they are not, I do not care particularly whether you state it as ten days or twenty-one days.

The President: I hope you are not asking the president to make a ruling on that now.

A Member: It seems to me, Mr. President, that Mr. Price has made a good point there. Personally, I think that the ballots should be sent out a good deal longer than that ahead of the meeting, especially as was done this year. For that preliminary there is apparently no reason why the ballots should not go out, and it seems to me that twenty-one days is none too short a time to get such a matter as that before the members. Personally, I should be opposed to any change in that provision.

The President: There seems to be considerable difference of opinion about the desirability of this provision. Is there any further discussion?

The Secretary: I think the matter should be fully discussed. We might desire to leave it as it is, and do the best we can.

Mr. Trowbridge: I listened to your explanation, but I do not quite get the point. Is that twenty-one days to be changed to ten days, or is the sixty days that you refer to, to be changed to ten?

The President: Oh no. Twenty-one days I read. I read it first to show the reason for fixing the twenty-one days, so that the members could get an idea of what was to be done in the twenty-one days.

Mr. Buck: Mr. Chairman, would there be any improvement, if the wording of that was to be revised so that at the time the preliminary ballots are sent out, the preliminary program should be sent out stating where the annual meeting was to be held, and when, and also stating as much about the proposed meeting as decided upon at that time. I think the National Society always send out some memorandum regarding the annual meeting.

The President: I believe that they do it on or before the first of December, or something like that.

Mr. Elwell: I presume there must be some good reason why we are asked to make this change. If there is a good reason, I think we ought to make it, but personally I am unable, as yet, quite to see the force of the proposition. I think we should have at least three weeks notice, and I am rather inclined to agree that it is better to leave it as it is.

I do not know whether in years past, there has been any difficulty about this. If there has been, I do not know that I have heard of it. I do not know why we couldn't get this information before the members at least three weeks.

A Member: Mr. Chairman, I agree with Mr. Elwell thoroughly. I think if this thing ought to be done, it should be done to give a little longer time and I move that it shall be amended by striking out the ten days and substituting fourteen, with the understanding that it is to be two, if possible.

Mr. Ford: I have got a lot of sympathy, Mr. Chairman, with the poor fellows who are charged with the duty of making up these programs. The President and Secretary certainly have a lot of difficulty in making all of these arrangements for our meetings and getting a satisfactory program.

With all that the officers of the Association have to do, I know it is a hard thing to get this out twenty-one days before the annual meeting. Having been a member of that infamous legislature which has been referred to here to-day, I feel that perhaps I ought not to say too much, but I quite agree with the suggestion to make it ten days. I think anyone who tries can then arrange his affairs so as to attend these meetings. I have been in office in the Society for several years with Mr. Kellogg, and I have seen how this thing works. It is pretty difficult to attend to all of these details and get this out tweny-one days before the meeting. I am in favor of the amendment.

SECRETARY KELLOGG: Mr. Chairman, being somewhat interested, as I am the one who has to get out those notices, I want to say that sometimes I do not get the information to be printed, in time to get it out. I know that the Committee on Meetings, both the chairman and the members, all have to work like beavers to get the thing together, and they get the information to me and we slap it into shape as soon as we can. If we can get our information earlier, we can get it out earlier, but it is physically impossible for the Secretary to get it out and comply strictly with the Constitution.

THE PRESIDENT: I think we are overlooking one point here. The object of this provision of the Constitution is to get the names, or to get the results appearing from the nomination blanks before the members of the Society at least twenty-one days before the annual meeting. I do not think we ought to get that matter confused with the question of making up the program. The question we are discussing is this question of getting these nominations before the members. It is just that. We are not discussing the program at all.

A MEMBER: Well, I understand that, Mr. Chairman, but what I had in mind was this: there is no objection so far as I can see to getting out this information on the ballots twenty-one days before the date of the annual meeting, or if that is too long a time, then I am in favor of shortening it up a little, as suggested by Mr. Ford. But the point I wanted to make was that this matter comes along just before the program for the annual meeting is made up and it seems to me that information as to the date and the place could be sent out at that same time, so as to notify the members at that time. It would save a little postage for an additional notice.

MR. TURNER: Mr. Chairman, I would like to call the attention of the Society to the fact that there seems to be some doubt expressed whether it is wise to make this change as recommended by the committee, but I want to assure the members that this matter was very fully considered, and the committee felt that they had given it full consideration when the vote was taken. There is avery small representation here this morning, and while I sympathize with all that has been said, still at the same time, there is a bare possibility that ten days is not sufficient for the sending out of these ballots. There seems to be a feeling on the part of some that that is the case.

THE PRESIDENT: Are you ready for the question? If so the question will first be upon the amendement which has been offered to make the time fourteen days instead of ten.

Voted against.

The President: The question now recurs upon the original recommendation of the committee to strike out the words "twenty-one" and insert the word "ten."

Voted against.

The next matter is the proposed amendment to Article IV, Section 3. To strike out the second paragraph as it now stands. Each member shall signify his choice of candidates on the ballot and return it to the Secretary in two sealed envelopes; the inner one to be left entirely blank and the outer one endorsed with the signature of the sender. In place of that the committee recommends that "each member shall signify his choice by placing a cross opposite each name voted for, or by writing the name, and shall return his ballot to the Secretary in two sealed envelopes. The inner one to be left entirely blank, and the outer one endorsed with the signature of the sender."

So voted.

Now in Article VII, the committee recommends that we strike out the word two in Section 1, insert one year.

The Secretary: Is that on the question of the payment of dues, or where a member is in arrears?

The President: Yes.

The Secretary: Is that ready for discussion? If it is, I object to that, because I have found that by keeping these fellows on, we have been able to bring in considerable money, and we have been keeping in some good men. I remember one instance where a member was behind for several years. He was having some financial difficulties. He made an application to me to see if he could get time to pay up. I said, "take your own time," and a little later received a check for $8.00 on account. He promised to send the rest soon. By doing this, it has kept in a good man. What is the matter with trying to keep one of our old men in like that, who may have gone broke. That's my idea about it. By leaving that as it is, we have a better chance to keep them. That's the way these things come up. A man is embarrassed, and he is not apt to say anything about it. Perhaps some of the rest of you members have been broke yourselves. You know how it is. I think that we want to be just as kindly as we can to men who happen to be hard up. If there is anybody who needs sympathy, I think it is the man who has had hard luck. I am in favor of letting that stand.

Mr. Wadhams: I thoroughly agree with the Secretary. Anyone who has had any experience trying to find arguments to use in order to bring in new members certainly does not want to be confronted with the argument that if a man doesn't pay up his dues in a year, he will be fired out of the organization. I am opposed to that. Oftentimes, a man may overlook his bill. I think it would be very inadvisable to change that word to "one" year.

Mr. Peck: It seems to me, Mr. President, that it would not be remiss for the Society to retain a man for two years. I think one year is too short.

Mr. Blair: It seems to me that we might get around that difficulty by putting it up to the Board of Direction. That's all that is necessary. If the Board of Direction is authorized so that they can give a man more time who needs it, it seems to me that that will answer the purpose. I make that suggestion.

THE PRESIDENT: Mr. Ross, will you take the chair for a few minutes? I should like to discuss this matter.

PRESIDENT-ELECT ROBERT J. ROSS TAKES THE CHAIR.

MR. JACKSON: I do this because I want to relieve the revisers of the Constitution, so far as I am concerned, from any responsibility for this proposed amendment. I think it is the outcome of a suggestion which possibly was made as the result of my experience of sixteen years in the Secretary's office, that we have been carrying men on the roll for two years, and it was practically impossible, under such circumstances, to keep an accurate list of the membership, and it was very difficult to keep the accounts of the Society straight. If these matters are left with the Board of Direction, the Board of Direction can either strike a man off, or carry him along, but I have never yet known of a case where a man had a worthy case, and was known to be hard up, where he was not given full opportunity to pay up his arrears. In fact, I have known cases repeatedly where the Board of Direction has strung men along for two, three, four, five and six, even seven years. Now, there is no sense at all in keeping a man on that long. If a man gets behind in his dues one year, and if he gets a notice at that time, why it seems to me, if he has got another year in which to make the payment, it is all he can reasonably ask. If you have got to wait two years before you send that, why that leaves an $8.00 indebtedness to the Society. In addition to that two years, it will probably take a year longer, before the Board of Direction will take action on it, and that means $12.00 of indebtedness to the Society with a strong possibility that it may go much longer. My object in recommending this to the committee is to get rid of that situation. It will not inflict any hardship on worthy cases. The Board of Direction can surely be trusted to take care of any worthy cases, but it does permit the Secretary and Treasurer to notify a man at the expiration of one year that he is behind, and unless he pays up, he is in danger of being dropped. It does not mean that he is going to be fired out. It will help the administration of the office of the Treasurer very much to adopt this proposed amendment.

I thought in all fairness to the committee, that I ought to make this statement. My experience is, that it will be helpful to the Society and help the Treasurer a lot to have that change made.

MR. DORRANCE: Mr. Chairman, I move that that change be approved and sent out.

Motion seconded and carried.

PRESIDENT JACKSON RESUMES THE CHAIR.

MR. TROWBRIDGE: Mr. Chairman, there is one point that I would like to call the attention of the meeting to. In the provision as to membership it is provided that if the dues are not paid within 30 days the matter shall be presented to the Board of Direction, which shall have power to drop such member from the roll. Now on the question of reinstating a suspended member, there is no provision made in the Constitution. There is no provision made in the Constitution for a reinstatement. I believe there are conditions where members could be regained if some such provision was made, and I would like to suggest that the matter be discussed, and that some such article be formulated for the Constitution. I believe that something along that line was brought to the attention of the committee but it does not seem to have been acted on.

Mr. Turner: The suggestion reached me too late for action by the committee, and at the same time it seemed to me personally, that there is no call for making any change. As I understand it, if a member who has been dropped desires to be reinstated, all he has to do is to make an application the same as anyone else. He can simply make an application for membership and it will receive the attention of the Board of Direction.

The President: At which time the Board of Direction would undoubtedly consider that fact and it would be up to them to make such recommendation as they thought was necessary, that is, whether his back dues should be remitted, or whether he should be admitted as a new member or not. That is my understanding of it. At least that is the policy that was adopted.

Mr. Price: Mr. Chairman, I would like to ask, has the Board of Direction, at the present time the power to reinstate a member who has been dropped for non-payment, provided he pays up the back dues, without the necessity of being re-elected by the Association?

The President: Yes, I think so.

Mr. Price: If he has been dropped from the roll of membership he is no longer a member of the Society, is he? If he is no longer a member, how can the Board of Direction re-elect him.

A Member: I think you will find that it takes a vote of the Society to put him back in.

The President: Well, I stand corrected on that. My answer to your question, Mr. Price, was guided largely by my experience. I do not know that the Board of Direction has the power to do that, but I do know that the Board of Direction has done it.

Mr. Price: My own experience is that that very thing has been done. I presume that any man who has once been a member of the Society in good standing, and who through some unfortunate circumstances went out, if he came back and offered a check to cover the amount of his dues to the Society, it seems to me that it ought to be unnecessary again to present his name to the Society for election. At the same time there are times when it is not the easiest thing in the world to write a check for $4.00, and one may get behind.

Mr. Elwell: I think the Board of Direction has that power.

Mr. Blair: It seems to me, Mr. Chairman, that we are taking too much for granted. If the Board of Direction has the power to do this, then the Board has the power to do all sorts of things. If a man is dropped from the Society for non-payment of his dues, he certainly is no longer a member of the Society, and if that is the case, how can the Board of Direction restore him; and how would he become rightfully a member again if the Society did not vote to take him in?

A MEMBER: Mr. President, I do not think the Board has the right to do that but I believe that it ought to have that right. I am in favor of taking some step to amend the Constitution so there will be no question about it.

MR. ELWELL: Mr. Chairman, I may have misled my married friend here in what I said a few minutes ago, but in my experience on Boards of Direction we have always believed, so far as I know, that we had the power to take care of these cases. It would be quite embarrassing to have the Constitution changed so that we would have to bring these matters up before the whole State. I think we had better take it for granted that the Board does have that power, and go on as we have been.

THE PRESIDENT: Has the Committee on Revision of the Constitution anything to offer?

MR. TURNER: The only thought that occurs to me, Mr. President, is that if the Board of Direction had accepted the application of anybody and reinstated them in the past without necessary authority, I am sure it has not been to the injury of the Society in any way. I am not sure whether an enabling clause is needed in the Constitution. Offhand I am inclined to say, no.

THE SECRETARY: I will say that in two cases that applied for reinstatement, the only ones that I know of, both of them said that they had been dropped. I didn't say anything about their being dropped. They were perfectly frank as to what the conditions were and asked if they could get back in. I just let it go.

MR. TURNER: It seems to me that there is some misunderstanding about this matter. We are hearing here a good deal about former members being unable to pay their dues for two or three years and who have been dropped for that cause. When a man ceases to be a member, can he properly be assessed for dues in the interval? It seems to me not. It seems to me that while he is not a member of the Society, while his name does not appear on our rolls, there is no reason why he should be assessed for back dues. My own feeling is that the Society would have no right to assess him for any of the time that he may be out, and that he should be taken in as a new member in the same way as any new member is. I do not see as it matters very much whether he has been dropped or not.

THE PRESIDENT: You mean that the whole amount of his dues should be remitted, or only the amount of his dues paid up to the time that he was dropped?

MR. TURNER: I think the Society would be entitled to be paid for the amount of his dues up to the time he was dropped.

THE PRESIDENT: Well, we do not seem to be coming to a complete agreement about this. I recall that this Society at one time, when a man was to be dropped, his name was read before the Society, and he was dropped for non-payment. I never liked that idea myself.

Mr. Buck: I think, gentlemen, we are wasting our time upon something which is not very profitable to the Society. We always have a Board of Direction which is selected with a good deal of care.

The President: There is no motion before me.

A Member: I have the following amendment to the Constitution which I will read.

Article 7, Section 1. Add to the present Section, "The Board of Direction shall also have the power to reinstate any member who has been dropped from the rolls for non-payment of dues, at their discretion, when all indebtedness to the Society has been paid." That has been signed by three members and we put it before you for action.

The President: You hear this proposition. Will you discuss it?

Motion seconded, and lost.

The President: The motion is before you. The question is called for. In the opinion of the chair the amendment is lost. I think that clears up all matters with reference to the revision of the Constitution.

Afternoon Session.

The afternoon session of the Convention was called to order at 2:15 p. m., President J. Frederick Jackson in the chair and presiding.

The President: I do not suppose, gentlemen, that there are very many present in the room whose memory carries them back to that period in Yale history when one of the most notable records of the many records which Yale has established was made in rowing, but I know that there are some here who can carry back in their memory to the period of 1888 or 1890, and can recall that famous crew that lives in the annals of Yale history and which established a record for time that has stood for the last twenty or twenty-five years. The captain of that crew, and the one whose leadership was largely responsible in bringing it to such a state of perfection in the art of rowing, gathered during that period, perhaps unconsciously, certain qualifications which in his after life in the business field he found of incalculable value.

After leaving college and spending a brief period with the General Electric Company he entered the service of The American Telephone & Telegraph Company and almost immediately was placed in charge of the development of that great concern in the middle west. His success there was such that the Company recalled him to New York, and placed him in entire charge of their then beginning development of the long distance telephone field. When the war came on he was selected by the Postmaster General as director of long line telephone in the entire country, and when the War was ended the Company saw fit to continue him in the same position with the same title of director. All through this extensive service he tells me that the experience and the knowledge of men that he gathered during his captaincy of the Yale crew was the foundation on which he built the organization of which he is now the head. And it is a great pleasure to introduce to you Mr. Fred Stevenson, Yale '88, Director of long distance telephone lines of The American Telephone & Telegraph Company.

Mr. Stevenson read his paper.

The President: I assume from the fact that none of you interrupted the speaker to ask questions as he requested at the start, is because you cannot formulate them in words of one syllable.

The speaker therefore, did not have any opportunity to answer your questions. Are there any questions which you wish to ask now? If not we will proceed to the next matter on the program. As you will see by the program we are to spend a half hour in learning a little about something which I personally know very little about. When you stop, as you do at times, to consider that you have lived on this planet anywhere from twenty to forty to sixty or seventy years, and that during that time for 365 days in the year you have probably gone out and looked up at the sky and if you have felt as I have felt that I was not really able, definitely able, to locate or point out or to tell the name of more than one or two constellations appearing in the heavens, it raises suggestion that an address on such a subject will certainly help to give us some much needed information. I think we are particularly fortunate to have with us this afternoon Professor Frank Schlesinger, director of the Yale University Observatory, who is remarkably well qualified to tell us in words of few syllables all about the stars. It is with very great pleasure that I introduce him to you. (Paper read.)

The President: I think we have all enjoyed Professor Schlesinger's talk and illustrations very much indeed. It certainly has been an unusual paper. Are there any questions which you care to ask? If not, we will proceed with our program. Most engineers who have been in active practice I think at times have all desired to have a little closer relation between the engineer and the lawyer. Not the relation of the engineer to the law, but the relation of the engineer to the lawyer. Some engineers perhaps have benefited by a little closer relationship with the law but I am not talking of that class. I think we have all felt that the relationship between the engineer and the lawyer could be helped a lot, if there were a better understanding between them. The gentleman who is to address us next this afternoon, or who will present the next paper, has had a very wide experience in and about New York City with large engineering problems, and is well qualified to talk to us about the proper relation between the engineer and the lawyer. He has had a large experience in consulting with engineers in the preparation of cases arising on big work. He has also had an excellent opportunity to observe both engineers and lawyers from the bench when he was a judge of the Supreme Court of New York, and in that way he is particularly well qualified, I think, to discuss or prepare a paper, the title of which he has chosen himself, namely: "The Engineer and the Lawyer." I take great pleasure in introducing to you the Honorable Robert L. Luce of New York City.

Mr. Luce read his paper.

The President: I think we are all deeply grateful to Judge Luce for his very interesting and illuminative paper. That completes the program of papers for the afternoon. The Chair will entertain a rising vote of thanks to the three gentlemen who have presented papers before us this afternoon.

So voted.

Adjourned to following morning at 9 o'clock.

Morning Session Wednesday, February 22, 1922

Convention called to order at 9:15 A. M., President J. Frederick Jackson in the chair.

The President: Now, gentlemen, if you will come to order we will endeavor to get started. What is your pleasure to do with the reports of the various committees, that were submitted yesterday? Is there any particular report that any member wishes to take up at this time and discuss? If so, I will take it up without further action.

Mr. Blair: Mr. President, I would like to call the attention of the chair to the report of the Committee on Publications. That should be discussed, I think.

The President: The report of the Committee on Publications is now before you for discussion.

Mr. Dorrance: Mr. President, the report of the Committee on Publications contains a number of suggestions as to the advisability of more frequent publications by this society, and also as to getting out the annual report, and it hardly seems as though we should merely accept the report and file it. It calls for some action or for further consideration of the recommendations. I am not quite sure what the proper procedure is or should be.

A Member: Mr. Chairman, I think it would be beneficial to the members present if the Chair would state briefly what the report recommended.

The President: As I recall it, and I am not very clear about it, the first thing was that the Annual Report ought to be published, and secondly, the recommendation was made, I believe for our consideration, that there should be published beyond the usual report, something in the nature of a quarterly bulletin of the society. That is my recollection of the gist of the report.

Mr. Price: There was an informal suggestion made yesterday, I have forgotten now who the member was that offered it, that in view of the fact that our finances were so low, it might be desirable for the society to levy an assessment of not more than two dollars per member for the purpose of raising the necessary money to continue our regular publication of the proceedings. I think somebody had that resolution ready to present here this morning. I don't remember who it was, but I think there was a resolution prepared with the idea of offering it, that we should empower the Board of Direction to levy an assessment, not to exceed two dollars, for the purpose of providing the necessary funds for the publication of our Annual Report, the publication to combine last year's proceedings as well as this one in one volume. In order to bring it before the society I would make that as a motion.

THE PRESIDENT: If there is no objection I will put that motion later, after we have finished this informal discussion. I understand the motion is seconded.

MR. PARKER: It seems to me, Mr. Chairman, that before anything of that kind should be done that the society should arrange to continue the publication of its Annual Report or bulletin. I don't know that we should attack the publication of the quarterly paper as proposed until we have successfully financed the matter, and have got the society on its feet. It seems to me that it would be proper that this question should be gone into by the Committee on Publications. In the meanwhile we want to be sure that our annual year book is published. I am very heartily in favor of assessing the members, subject to the direction of the Board of Direction, for either one dollar or two dollars.

MR. FERRY: Mr. Chairman, I think that we owe it to the members of the society to publish the annual bulletin. It is the only means they have of knowing exactly what the society is doing, and of getting the advantage which comes from the publication of the papers and the discussions upon them. I know there were many times when it was impossible for me to attend any of these meetings, and my only way of keeping in touch with the society was by that publication. I think that those members who belong to-day and are not able to attend the various gatherings should be taken care of by the publication of our annual bulletin, so that they may be familiar with the actual happenings and meetings during the year. I think above all things, no matter what else the society does, that we should publish this annual bulletin.

MR. DORRANCE: I understand, Mr. Chairman, I don't know whether I am right about it, but my understanding was that this Committee on Publications was only a special committee, lasting for one year. Am I correct about that?

THE PRESIDENT: That is right.

MR. DORRANCE: The suggestion was just made that we refer this matter back to that committee. It will probably be necessary to have a new committee. I think there is no question but what we all agree that it is desirable that the annual book should be published and within a very short time after the annual meeting. But as I remember the report of this committee contains a number of other suggestions which should have some consideration, I would move you that a committee be appointed to consider those suggestions of the Publications Committee of this past year and report back to the society at the meeting to be held at the summer outing.

THE PRESIDENT: Will you let that motion take precedence of the other motion which Mr. Price made?

MR. PRICE: Yes, Mr. Chairman.

THE PRESIDENT: May I get that motion before the house? If that is made in the form of a motion it should be amended.

MR. FORD: I will make it in the form of an amendment to the original one. That the matter be referred to the Board of Direction for such action as they deem necessary.

The President: I suppose that being a motion to refer, it is in order to be put first. It is regularly moved and seconded that the society appoint a committee to consider the recommendations made by the Committee on Publications. That motion has been amended that the whole matter be referred to the Board of Direction for its consideration. You will now discuss the motion to amend. Let me, for your information before the discussion proceeds, read to you from Section 5, Article 3, of the Constitution. "Duties of the Secretary. He shall publish the annual report."

Mr. Ferry: It doesn't leave any discretion. It says "He shall do so." How is he going to do it though unless the society provides him with the necessary funds.

The President: I mean as to the form it shall take, etc. Now, furthermore, let me read to you another part of the by-laws just for your information on this matter so that you may understand it and vote intelligently. In Section 9 of the By-Laws—I don't know as this is correct, but it would seem to indicate that the Board of Direction was the final body to take care of this matter—"All forms, such as blanks for application for membership, ballots for officers, ballots on amendments to constitution or by-laws, and other necessary blanks for the conduct of the business of the society, shall be prepared by the Secretary and approved by the Board of Direction." That doesn't seem to me to quite hit the case, but still it would indicate that the form of make-up of a report would be the duty of the Secretary after receiving the approval of the Board of Direction.

A Member: As I understand that by-law, Mr. Chairman, the way that reads, while it is a duty of the Secretary to publish the annual report, it does not say how the Secretary shall get the money except from dues. It seems to me that we ought to authorize the Board of Direction by vote here to assess the membership of this society to the amount of one dollar or two dollars, or whatever is necessary so that the whole thing can be completed and the Secretary can then go ahead and get out this annual report. It seems to me if the motion is amended so as to authorize the Board of Direction, if necessary, to assess the members for the amount necessary to cover the cost, the whole thing will be settled.

The President: Will you discuss the motion further? The question is upon the original motion, which was that the suggestions of the recommendations contained in the report of the Committee on Publications be referred to the Board of Direction. That is the form which it has now taken. The amendment is carried. Motion now recurs upon the original motion. The original motion was that the report of the committee, with its suggestions and recommendations, be referred to a committee to be raised by the society. Of course the effect of the amendment would be to throw the whole matter on the Board of Direction. You will now vote upon the original motion. Let me call your attention to the fact that, as yet, no way has been found to finance this matter This, I understand, is to come later. Some of the members have expressed the opinion that the matter was already taken care of, and that there was no need of this motion. The Chair does not want to indicate how you shall vote.

Mr. Dorrance: If I may suggest to the Chair the motion as put was not correctly repeated by the Chair. The motion was that it be referred to a committee to consider and report to the summer meeting of the society.

The President: I stand corrected. But the amendment referred it to the Board of Direction.

Mr. Dorrance: I don't care whether it is the Board of Direction or some special committee as long as that report of the Publications Committee is given further consideration and not just accepted and placed on file.

The President: The Chair stands corrected. The original motion then is that the report be referred to a committee to consider the suggestions and recommendations and report back to the society at the summer meeting. As amended the motion is that the whole matter be referred to the Board of Direction to report back to the summer meeting with recommendations. It is a vote and so ordered.

Now, then, the decks are cleared. If anybody wishes to offer a motion as to the proper method of financing the society during the coming year there is an opportunity to take it up.

Mr. Price: Mr. Chairman, there was a motion made by me, I think, to lay an assessment. I didn't withdraw it. If I remember right, it went over because of a suggestion by the Chairman. I should think that would take precedence to any other motion now.

The President: I thing it will have to be offered anew.

Mr. Price: I think the same motion is here in written form and if the Chair so rules I will offer it anew. I am not personally in favor of raising the dues and I question the expediency of raising the dues to meet a special emergency as this seems to be.

The President: I think that represents the sentiment of quite a few of our members.

Mr. Price: The motion was, Mr. Chairman, that the Board of Direction be authorized to levy and collect one special assessment of not to exceed two dollars per member at such time as the Board might deem expedient.

The President: Then it is before you for action.

Mr. Dorrance: That does not carry more than enough for one year.

The President: That's the way I understood it. I do not understand that it was the intention that it was to lay an assessment every year. This calls for an assessment of not more than two dollars, per member, according as the Board of Direction shall find necessary. Are you ready for the question?

It is that the Board of Direction be authorized to levy and collect one special assessment of not exceeding two dollars per member at such time as the Board may deem expedient.

Mr. Ferry: It seems to me that it should be made a little clearer. That does not state what the purpose of the assessment is. We are discussing the raising of money for the purpose of continuing our yearly publication. It seems to me that it should be expressed in that vote that the assessment is to be levied for the purpose of our publications.

The President: That is what we are supposed to be discussing.

Mr. Ferry: Well, isn't that offer for the purpose of raising a fund for our publication?

The President: That is what we understand, but it doesn't so state. That is true.

Mr. Price: Mr. Chairman, you have read to us the provision of the constitution, I think, that the Secretary is to publish the annual report. It makes it his duty, but he has not been able to carry that out simply because of no funds.

The President: Well, can't you and Mr. Price, Mr. Ferry, get together and formulate a resolution which will be satisfactory.

Mr. Ford: It seems to me that we are taking the wrong tack in this. I think this is a matter which should be handled by the Board of Direction.

The President: It is left to the Board of Direction indirectly, Mr. Ford. The resolution that was put in stated that the Board of Direction be authorized, etc. They can do it or not. Under that resolution the Board of Direction, as I would interpret it, can do it or not.

Mr. Price: Mr. Turner suggests that the resolution be worded so that the Board of Direction will be in a position to carry out the intent of it or the intent of this meeting, and that being the case, it is understood that the Secretary will publish the proceedings for last year as well as this year's report.

Mr. Turner: Mr. Chairman, before you put that motion I would like to add this: The constitution says that the Secretary shall publish this report. I don't suppose he can publish it if he hasn't got the necessary funds, and clearly the intent of this resolution is to provide the funds. If the reports for these two years are published together, while the cost will, of course, exceed the cost over one year, yet we will have our regular revenue this year and I think that the authority conferred upon the Board of Direction to lay an assessment of not to exceed two dollars would provide ample funds for the purpose.

The President: Perhaps Mr. Turner's explanation clears the matter sufficiently so that you are ready to vote. "Resolved: That the Board of Direction be authorized to levy and collect one special assessment of not to exceed two dollars per member, at such time as the Board may deem expedient." So voted.

Mr. Ferry: There is one matter, Mr. President, that should not be passed over. The legislature of the State meets before there will be another annual meeting of the society, and it seems to me that action should be taken so that the legislative committee should be continued for another year. I would move that our Committee on Legislation be continued for another year.

After discussion and remarks by Messrs. Buck, Hill, Ferry and the President, Mr. Ferry withdrew his motion.

Mr. Dorrance: I think Mr. Buck has made a very good Chairman, but I agree with him that the incoming President ought to have the power to re-appoint Mr. Buck if he wants to, and if he doesn't, then he can appoint somebody else.

The President: The Chair would suggest that as a way out of this that somebody move that the present committee be discharged with the thanks of the society.

Mr. Dorrance: Mr. President, I make that motion. Carried.

The President: The Chair will now entertain the motion that the appointment of a legislative committee be left to the incoming President. Should not the number of the committee be fixed? What do you say about that, Mr. Buck?

Mr. Buck: I should say all we can get, of good men for that work. There should be three anyway. I move that at least three nor more than five shall be appointed, by the incoming Presndent, as a legislative committee.

Carried.

The President: Is there any other miscellaneous business that you wish to bring before us at this time? If not we will proceed with the regular program.

The first paper that we have is by one of our own members, Richard L. Saunders, Deputy Commissioner of Highways. The paper is entitled "The New Washington Bridge over the Housatonic River."

DISCUSSION.

The President: Mr. Saunders' paper is now before you for discussion. Are there any questions?

Secretary Kellogg: Did you have any trouble in getting good sand for the concrete work on the Bridge?

Mr. Saunders: No. We were able to get a very good grade of sand. Most of it came from Long Island.

Mr. Bush: I would like to ask Mr. Saunders about the consistency of the concrete that you placed there. Was it sufficiently wet so that it would flow?

Mr. Saunders: It was a rather dry mixture It was not a solid mixture. It would flow easily in bulk. It was not the usual form of concrete mixture, but was a little bit drier. Not dry in the sense that there was no moisture in it, but drier than the usual mixture.

Mr. Bush: Did you find that that worked well after the cassion was pumped out?

Mr. Saunders: 'Yes. We had no trouble with it.

Mr. Ross: Mr. Saunders, will you tell us, please, what was the width of the roadway there?

Mr. Saunders: There is a state law which calls for a forty-three foot roadway where there is a double track, and for thirty-three feet for a single track. Forty-three feet is the minimum where there is a double trolley track crossing a bridge as in this case.

A Member: That does not give you a very wide road.

Mr. Saunders: It gives sufficient space so that traffic may pass safely.

Mr Bush: I'd like to ask what the volume of travel is there?

Mr. Saunders: We get about 10,000 vehicles a day. It averages about that.

Mr. Ross: A good many autos stop on the bridge.

Mr. Saunders: Yes, they quite frequently stop to get the benefit of the view up and down the river, and we have a rest room there in the center. That has proved very satisfactory. Everyone seems to be able to use it safely.

Mr. Elwell: In connection with this matter it may be interesting to note the argument used by a man representing a joint committee from Stratford and Bridgeport, in connection with one of our hearings for the reduction of fares. He said if the railroad would only reduce the fares to five cents in that section there would be enough extra travel going up that way to well repay the company. That seemed to be his idea of the extent to which the new bridge would be used. To use that as an argument in favor of reducing the fares.

A Member: Did I understand Mr. Saunders to say that there were about 10,000 vehicles a day that passed over the bridge?

Mr. Saunders: I believe the figures taken showed that there was an average of 10,000 vehicles in twenty-four hours. I think exactly within fifty or sixty of ten thousand vehicles. Of course the season makes some difference. The normal traffic will run, I should think, between five and six thousand at this time of year.

A Member: I think you said in your paper that the bridge cost $1,500,000. I would like to ask if that included the cost of the approaches?

Mr. Saunders: Yes, that was everything. Of course the main part of the construction was carried on while prices were high growing out of the War. We probably would have saved some money if the bridge had been built at some other time. Of course we couldn't anticipate any such prices.

Mr. Hill: Was that the contract price or was it built on a cost plus?

Mr. Saunders: No, it was a contract. We had three bidders.

The President: If there is no further discussion of Mr. Saunders' paper, we will take up the next paper, which is on the subject of "The Stamford Sewerage System," by Mr. Paul Nash, City Engineer of Stamford.

The President: This paper is now before you for discussion.

Secretary Kellogg: If there is any time for discussion, I want to say that in my early days I drew a map of Stamford, and later on I began to wonder whether that old map was still down in Stamford. I was wondering if that map which I drew in 1742 or a little later was still down in Stamford.

Mr. Nash: There is one there of about 1500. I don't know about that one of 1742. (Laughter.)

A Member: I'd like to ask Mr. Nash just a question about those elevations. Do those elevations rise as the sewer works back up into the central portion of the unit.

Mr. Nash: Yes. The elevation is a gradual one up into the central portions. Yes.

Q. And about the walls of those sewers. Are those cased up?

Mr. Nash: No.

Q. Did you use gaskets?

Mr. Nash: No. We used asphalt.

A Member: Mr. Chairman, there are two points that interest me particularly in this paper. The first is the foresight shown by Mr. Waring in providing against intercepting traps. I speak of this particularly because there came to my desk a while ago some photographs which showed how well his conclusions were founded, and which illustrate the great necessity of relieving the foul air of the sewer. There is no particular advantage in the intercepting trap because the air of the sewer is let free and there is no danger of its removal through some other vent into the factory or house and it is carried off at no point except at the point where it is carried into the air as planned. This whole matter of running-traps with back vents is a vestige of prehistoric days. I speak of that simply as an example of some of the nonsense that Waring got out of the heads of some sewer people.

The other point is the fact that Stamford is now doing for the disposal of her house sewage just what other cities in the State ought to do, and what we ought to do in Waterbury.

Mr. Price: I was going to ask Mr. Nash if he would tell us whether there has been any disadvantage from locating the Imhoff tanks in such close proximity to the houses.

Mr. Nash: No, we have had no particular trouble from that. We were troubled quite a little at one time, but there is practically none now.

Mr. Hill: I would like to ask Mr. Nash in regard to his outlet into the bay whether he has ever noticed any offensive matter whatever or any appearance of it?

Mr. Nash: You mean at the present outlet, Mr. Hill?

Mr. Hill: Yes.

Mr. Nash: I have not.

A Member: Did Mr. Nash say what the cost of that plant was?

Mr. Nash: The contract called for about $200,000.00 complete.

The President: The next paper on the program is one entitled "Street Widening," by our fellow member, Mr. Charles A. Ferry. Mr. Ferry needs no particular introduction to the members of this society.

Mr. Ferry: New Haven, like every other county is up against the proposition of congested streets. I have been acting as a member of a subcommittee of the Chamber of Commerce to see if we could devise some way to remove this difficulty, and help settle this matter. We have had several meetings to discuss it, and various different plans. I suggested a plan which I am going to present to you this afternoon, and this plan the legal member of our committee thought was constitutional, but which other members of the committee thought was entirely impracticable. I know that there is nobody any more practical than city engineers, and they are really more interested in the subject than the average engineer. It is also a matter which closely concerns everybody who has occasion to use the streets, which means about everybody, sometime or other, who is able to get out of the house. So I thought there was no one from whom I would be any more likely to get advice on the subject than you, and so I decided to bring the matter before this meeting. I have prepared a paper on this subject, not with the intention of solving the problem but with the hope somebody else here will help to solve it.

MR. TERRY: Mr. Chairman, I would like to ask Mr. Ferry as to one phase of the matter which it seems to me that his paper brings up, and which arises under the present building line ordinance in Bridgeport. In the erection of structures outside of the established line, or the line which has been established by the city, the city pays for the land outside of the line, but does not pay for the buildings. Then when any additional new buildings are put up, of course, they have to go back beyond this line. In case of alteration the building also has to go back. There is nothing paid for the building in such cases. Our difficulty has been that whenever any person wanted to make any change the Council would extend this building line in that block, and then they would go ahead and do it. I don't know whether it is constitutional, what we are doing, but certainly it is a practice which raises considerable question. The city says in the ordinance that a man cannot build out in front of that particular line if he wants to and imposes a penalty on him. If trouble arises, however, the Council is very susceptible to influence from outside, and is apt to rescind the former action so as to accommodate anybody that wants to go over the building line. Now, does your scheme provide that when action is once taken it shall not be rescinded?

MR. FERRY: The idea is here. My suggestion related more to a scheme to relieve congestion of traffic than to any difficulty with the building lines. The idea as given in the paper being to condemn the land on each side and then to rent back to the abutting owners so as not to deprive them of the use of it until it was required for city purposes. Everything is done subject to those conditions. That is, the difference in land between the present street line and the building line remains in the possession of the owner. He can do anything with the land that he rents except build on it out beyond the building line. Of course when the time comes to take it some process would have to be gone through with, I suppose, to re-establish the street line.

MR. TERRY: In Bridgeport we didn't follow the building line strictly. That is what makes the trouble and that is what I was trying to ascertain, whether Mr. Ferry or others here had had any experience in a situation of that sort. It didn't seem to me that where the line had been once established the Council ought to exercise any such power as that. In this case that I had in mind that line was a ten foot building line back from the street line, and when it was re-established it made a cut in other buildings in that block. Our difficulty has been that the Council will rescind former action establishing the line. In other words, setting up a procedure something like what you propose. As a practical matter I was wondering if we might not get at something that would prevent the Council from rescinding the line that we once established. As yet we have not found any remedy for this defect.

MR. FERRY: I should question very much whether the Council has any power to rescind that order like that.

THE PRESIDENT: Has not that same matter been up and been decided in connection with some ordinance? My recollection is that they tried that in New York and there was either some litigation about it or they endeavored to get some regulation on it.

MR. PRICE: I had that same thing in mind and I was just about to speak of it. In New York we had for several years a very striking example of that. When they attempted in lower Broadway to make a change in the street, the New York Life Insurance Company had a very beautiful entrance to its building. It was certainly a magnificent entrance with large towering pillars of granite on it in front but it encroached upon the building line that they had some years before. They had a permit, I believe, under some action by the city government to put that front where it appeared. The matter was fought out through the courts. The case went to the highest court, where it was ruled that inasmuch as the building line had been established the succeeding Board of Aldermen had no right to permit the encroachment upon that building line that had been established. In other words the City was successful in court and the New York Life Insurance Company had to remove that beautiful entrance inside of the first established line that they had been given a permit for and right by the then existing Board of Aldermen.

A MEMBER: Was that upon the building line or the street line?

MR. PRICE: That was the building line. In order to widen the street it was necessary to cut back from the sidewalk, but they couldn't cut back of the sidewalk without changing those entrance lines. That particular case was carried to the courts, and I believe finally all of the buildings through there from the City Hall south towards Bowling Green were sliced off wherever they encroached, the court ruling that it was a matter of great moment to any community that the building line when established should not be disregarded by the succeeding administrations, that it affected the city as a whole and that further they upheld the preceding action.

MR. CLARK: It seems to me that so far as Connecticut is concerned Mr. Terry has got at the nub of the matter. The difficulty, and in fact the importance of having any assurance that political bosses under the stress of political expediency will move the building line, is something which engineers are apt to be up against at any time. I understand the legal department of the City of Hartford has advised that in laying out new street lines, where it seems necessary, and widening beyond the lines or limits indicated by existing structures, that such widening may be made as a part of the street, allowing such structures to remain provided no damages are paid for the removal of them until such time as they have outlived their usefulness or given away. I hope I make that clear. Of course in a case where the building line is rescinded after having been once established such as Mr. Terry mentioned, it is an entirely different proposition. It would seem to me that a little pressure brought to bear by the owners of the property in a case of that kind might result in the entire modification of the building line or a reversion to the conditions as they existed before its establishment. I do not know, however, about the conditions in Bridgeport.

The City of Hartford recently undertook in connection with its campaign for the widening of certain streets two or three things which may be of interest. In one case where it was thought to be for the interest of the municipality to widen the street it was assumed, or it was declared to be the main traffic route from the center of the city and they sought to get at it by setting back the building line. The street at the beginning was probably forty feet wide, and it was decided that by setting back the building line on one side of the street it would ultimately cause the removal of the buildings back of that line. It was a sort of temporary expedient with the idea of securing an automatic or ultimate removal of such structures as were then over the line. The line was put in accordance with the charter requirements. Of course the charter, as you all know, contains certain requirements which have to be complied with in establishing the line and among those requirements, of course, is a hearing given to those who are affected. When it came to the hearing and everybody interested had an opportunity to express their views, opposition to that plan developed to such an extent that the Board of State Commissioners who had this matter in charge were convinced that the cost of establishing this building line in that way would be, in fact, not much, if any, less than it would be to establish a new street line at this time, and secure the necessary widening of the street and the resulting benefit without waiting for the slow process which the other proposition involved. The result was that they recommended the appointment of a committee and that new proceedings be taken to establish the building line.

I believe that an effort was undertaken at the last session of the legislature to secure an enabling act which would permit cities to enact their own ordinances, whereby the use of property, or the use of land on which buildings are now located, could be regulated; and in that way, as you can see, regulate the traffic and obtain some relief for traffic congestion. It is, of course, obvious to you that the day has gone when we can say that a street forty, fifty or sixty or one hundred feet in width is adequate for the city conditions which we are familiar with. We are all conscious of the difficulty which these problems present. There are many things and many phases which must be taken into consideration. We must consider the streets as traffic lanes, and due consideration must be given to the use of them for trolley lines.

MR. TERRY: Do I understand, Mr. Clark, that in Hartford they had a decision or ordinance that the street lines would be established and then that they couldn't be removed?

Mr. Clark: No. I don't understand that to be the case, but I think that is one of the legal phases of the matter which has not been decided in Court in any case.

Mr. Terry: Your legal department, as I gather, has advised that Mr. Ferry's proposition or his idea was unconstitutional.

Mr. Clark: That has nothing to do with building lines. As I understood Mr. Ferry in his talk his purpose was to establish building lines which would ultimately become street lines.

Mr. Terry: And has your legal department advised that that was unconstitutional otherwise?

Mr. Clark: I don't know about that. I assume they have taken the constitutionality of that proposition I outlined into consideration. I may say, however, Mr. Terry, that the question that was put up to the corporation counsel and his reply was based not upon the contemplation of removing any suitable or substantial building, but mostly objects which protruded, stoops, second stories, areaways, iron fences and objects of that nature. We are therefore at the present time engaged in preparing a plan for arcading which should result in a substantial saving of expense. Of course this proposition contemplates widening the street up to the height of about the first story; or taking the building back from the face of the building, taking the lower story only for a distance of sixteen feet. Afterwards, of course, if at any time that building should happen to be removed either by accident or design, no permit for the renewal of the structure would be given.

Mr. Terry: I would like to say that I thoroughly agree with Mr. Clark in so far as the regulation of traffic is concerned. Some such means must be adopted. That's the first thing to do. On the other hand, in the construction of street widening, if it is necessary, and I agree with Mr. Ferry that it is so far as principal thoroughfares are concerned,—I agree that some such plan for the acquirement of the land should be adopted. I think that one of the most important things in Mr. Ferry's proposition is permitting the abutter to receive rent for the use of the land as long as any person stays on it. I rather think that would tend to hasten the owner getting off that land as most of them dislike to pay rental to the city.

Mr. Ross: In Hartford we are not so much inclined to worry over the question of legal rights if we can only get the corporation counsel to say it is all right. Because it is up to him and he is the one that has to take care of that. If he tells us that we can go ahead we get busy and do it before we have another one who may say something different. In all these matters there are always two big questions. One is the physical proposition, how the work is to be done, and the other is the financial proposition of how the work is going to be paid for and who is going to pay for it. I would like to ask Mr. Ferry this question. You said, as I remember, that in some instances it would be desirable to have a street widened from fifty to eighty feet. I would like to know if in such instance he intends to make the damages and benefits equal?

A Member: I think they have had some recent experience in Hartford in connection with the widening of Church Street. Perhaps Mr. Ross can tell us about that. That may shed some light on this question that has been raised by Mr. Ferry's paper.

Mr. Ross: Well, in connection with the Church Street widening in the block between Trumbull and Ann they appropriated, I believe, $250,000. That was a very narrow street and it was widened fifteen feet. That meant fifteen feet off the buildings. Because of the character of the buildings on that street, and from the fact that on one of the principal corners there was a very substantial church we could only get seven feet there. So we arranged and took seven feet on the south part and eight feet from the north, making fifteen feet in all for the widening. Now, there is something of a little interest that grew out of that, and that was the effect on the land values there. The effect on the street was immediate and greatly beneficial. The people were given in the first place two or three months in order to remove their porches. As soon as the building lines were established these people took counsel and someone took the matters into court, but in the meantime the city gave them three months in which to remove those obstructions and then if they didn't do it the City was to do it for them. Well, within a year after that improvement was started most every building all through there had a new front on it. The character of the street changed within a year so that the property values doubled and trebled in value. The assessment placed against those properties was fifteen per cent per front foot. For instance, they figured that if before the work was done my land was worth $800 a front foot then afterwards it would be 15% on that $800, but the people really got back far more than they were obliged to pay in the way of assessments. The benefit was so much greater on that particular street that the case was a notable one. Not only that but the benefits which resulted all through that area, and even on the streets adjoining was very much, and property that was held at $800 a foot went to $2,000 a foot. So that the problem of where you are going to get your money, or how you are going to raise your money where you have the authority to assess, is not a very serious one.

Mr. Hill: Mr. Chairman, Mr. Clark spoke of the arcade plan which, as I understood him, was being used in connection with certain street widening in Hartford. That plan would seem to me more economical than to take the whole building. That is done in some English towns. You will find in most of the streets where that plan is worked out that the sidewalk is placed under the building, or in the space occupied by the first floor, leaving the upper floors projecting over the walk. That is what is called the arcade plan. That would be more economical in many cases, but there are cases where the buildings are brought nearly all on a line, and, of course, in those cases the plan could be applied to better effect, than where the buildings are irregular. Then you are apt to get into difficulties very quickly.

As to the assessment of benefits and damages, I am sure that property owners would try to prevent the cutting of the buildings in halves. That would be practically confiscating the property and the damages would be pretty heavy.

The President: Mr. Terry, have you something further to add?

Mr. Terry: No, Mr. Chairman, except this. Our interest in connection with Mr. Ferry's method was rather as to the idea that he apparently had in mind that streets are not discontinued, or anything of that kind, but the plan which he proposes seems to provide for a gradual widening as the space may be needed and for leaving the land in the possession of the property owners as long as possible. His scheme is workable as I look at it in so far as it safeguards the city from destroying its own rentable property.

The President: We will proceed to the next paper, which is a paper on "Maintenance Guarantees of Roads and Pavements," by Mr. Edward W. Bush of Hartford.

Mr. Bush: This paper which I have prepared is a very short one. I have some copies of it and perhaps it might aid in the discussion of it if I should distribute them.

In this good land of steady habits I think in many ways we continue things that have existed in the past merely because of inertia or tradition, and I believe many engineers, associated in city work, are apt to continue the same methods that their predecessors had for no good reason than that others have done it before. One of the things that we have carried along is this matter of maintenance guarantees, on construction contracts. It is one of the essential points of underwriting construction contracts which is always considered, and especially in connection with the authority to issue bonds. Since I have been engineer of a surety company I have had my attention very closely directed to this subject and it doesn't seem to me to be fair to call for maintenance guarantees. I am going to give you my reasons. However, this paper has been written with the hope that it will create discussion and perhaps a little better understanding of the subject.

The President: This paper is now before you for discussion.

Mr. Terry: Mr. Chairman, some years ago as city engineer of Bridgeport I tried to abolish the guarantee system on our permanent pavements but I was not successful. There is one thing which is rather peculiar with a guarantee on a permanent pavement job, and that is that the engineer has very little to do. While the engineer may be consulted as to the details of the contract so far as engineering is concerned the Board of Aldermen and the legal department take care of the rest.

Mr. Hill: I have been very glad to hear this paper. I think almost all engineers who have had anything to do with contracts where there was a maintenance clause inserted, or a guarantee clause, will emphasize the importance of the point made by Mr. Bush. You cannot put a guarantee clause in and expect to stand on it where there is an inspector and supervisor on the work, and then expect, if everything doesn't come out right, claim to guarantee. It is true, as Mr. Bush says, that if you put in the guarantee clause you must have no inspection or supervision. I think this question of guarantees in such contracts is something that ought to be abolished.

Mr. Clark: Mr. President, as a city engineer of some years' experience with paving work I want to commend this paper of Mr. Bush's and I think that Mr. Hill's remark just now hits the nail squarely on the head. This question of guarantees is one which we need to consider. I assume Mr. Bush, in saying what he has to us to-day, has been speaking from the standpoint of some experience with pavements. Mr. Dyer brought up a point which Mr. Bush evidently had not considered, and that is that many pavements or pavements in many places are laid without decent supervision, or under the inspection of engineering experts. The point in that regard, I believe, is well taken. There is a side-light on this that might be considered. In certain cities of this state, where the charter requirements are such as to permit it, assessments are laid both for pavements and for the maintenance of pavements. There is a distinction between an assessment for a pavement and an assessment for the maintenance of pavements. The two are entirely separate. In Hartford we have been advised that an assessment for maintenance purposes should not be levied; that an assessment in the case of one includes the maintenance. Following out the analogy a little further I think it must be obvious to all of you that the charge for the guarantee is not a proper charge against the first cost of the pavement but is a charge for maintenance, and therefore cannot be assessed for. Then came the problem of differentiating or splitting up that slight cost into the first cost or cost for maintenance, and which I think you must admit is practically an impossible proposition.

The facility or difficulty with which contractors may obtain bonds from certain bond houses comes also with interest into the matter. I recall an instance in a certain city where a contract of no particular financial standing always had the work of a city. After some years, however, he began to get a little competition and for a couple of years or so he failed to land the jobs which he had formerly had. In connection with the letting of the contracts he endeavored to have a clause inserted which required that the bonding company must have an agent in that place. Not being successful in that he endeavored to require a ten year guarantee instead of a five. He believed that he could furnish a bond for ten years on the basis of his past performances, and that there was no other contractor who was so well known, and that he would therefore be sure of the contract. Nothing but difficulty resulted.

Mr. Bush: I would like to say in answer to what Mr. Terry and Mr. Clark have said, that, in many pavements which are laid under poor supervision and under circumstances beyond the control of the engineering department, in my opinion, doesn't lessen the obligation of the engineer to stand for a reform in this matter, if it can be called a reform. I believe there is a point here which needs our attention.

Mr. Terry: I agree with you in your paper absolutely, and I was merely trying to point out one of the difficulties with which we are faced in paving work.

Mr. Bush: It seems to me uneconomic to the contractor and to the public to try to perform a maintenance service that the public can do for itself in another way and do cheaper. We all know there is no present permanent pavement. No such thing has ever been laid.

Mr. Clark mentioned something about a contractor trying to get an ordinance introduced limiting the sureties on work to those only having a representative on the ground and being qualified in the state, but I think he overlooked to state that about all of the reputable surety companies are qualified in practically every state and of course have agents qualified to act in practically all places. The bonds, as some of you men know, are very seldom written at home. I do not suppose at Hartford we execute a half a dozen bonds in the year. Almost all of the larger bonds are written by some local person who is particularly authorized to sign them on behalf of the surety company.

A MEMBER: Mr. President, may I ask one more question. What is your attitude, Mr. Bush, with reference to guarantees on patented pavements?

MR. BUSH: Why, that is a case where the contractor writes his own specifications and does his own inspection. Where the contractor offers a certain proposition put up in that way I should think that the maintenance guarantee was proper, but, of course, the surety would consider before it wrote a bond for the contractor how long he had been laying that kind of a pavement, what success had been had with it, his financial responsibility and the length of the guarantee, that is, whether it was three years or two years or five years. In extreme cases the guarantor might want a deposit of collateral.

THE PRESIDENT: At this point in the meeting, gentlemen, it is my rather sad duty, but I assure you that whatever sadness I have is brightened by the fact that it is my duty not only to lay down the office of president of the society but to introduce to you the man whom you have elected as my successor. I do so, as I have said before, with very hearty appreciation of the support which you have afforded me during the year in which I have acted as president. I have endeavored, during the past year, so to conduct things as to interest the younger members of the association in its work and at the same time being careful to seek and to be guided by the advice and experience of our older members. I believe you must agree with me that the success of this society was bound up in securing the interest and support of the young members of the engineering profession in this State, who must come in and take up this work and carry it along.

I now take great pleasure in turning over the affairs of the society to Mr. Ross, your newly elected president. (Applause.)

(Mr. Ross takes the Chair.)

THE PRESIDENT: Gentlemen, I do not know that there is anything more to come before us except to say to you that the time is about come for dinner.

Before we adjourn, however, it strikes me that the society owes a vote of thanks to those who have worked so well and faithful in the past year for its success. I would ask that you express that by rising. (Rising vote taken unanimous.)

THE PRESIDENT: I would also suggest that a vote of thanks be extended to all of the speakers who have been on the program and to Yale University for the use of this hall, and to all who have contributed in making this annual convention a success. It is unanimously passed.

Meeting adjourned and the annual dinner was at the Hotel Taft.

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E. W. Bush, Chairman, P. Sellers, R. N. Clark, Prof. C. T. Bishop, F. J. Trowbridge, W. H. Sharp, L. W. Robinson, R. C. Cram.

COMMITTEE ON MEMBERSHIP.

J. P. Wadhams, Chairman, A. D. Blakeslee, R. L. Saunders, G. L. Mylchreest, J. A. McElroy, F. B. Jaynes, G. W. Sunderlin, E. H. Beard, G. K. Crandall, S. B. Palmer, G. L. Bilderbeck, J. E. Boylan, F. G. Patience, J. A. Toner, W. A. McKenzie, W. J. Backes, G. E. Hamlin, W. S. Brewer, L. H. Burt, H. E. Carlisle, V. B. Clarke, E. H. Everit, C. E. Price, E. C. Welden, J. W. Cone, P. L. Minor.

AFFILIATION OF CONNECTICUT ENGINEERING SOCIETIES.

Announcement of Organizing Conference to be Held in New Haven, Saturday Afternoon, March 11, 1922.

An organization conference of the delegates invited from the various engineering societies will be held at the Mason Laboratory, 9 Hillhouse Avenue, Saturday, March 11th, at 2:00 P. M. Participation is expected from fourteen or more societies that have already appointed delegates to this conference.

There will be a review of the steps already taken, and a further explanation of the work which may be accomplished by the proposed affiliation. A suggested constitution will be submitted for consideration by the delegates. If the conference approves, it is hoped that the constitution will be tentatively adopted and officers elected subject to final ratification by the member societies.

It is hoped that *every society* will be represented by all its delegates or alternatives and that all the delegates will be prepared for enthusiastic support of the affiliation movement. Delegates are at liberty to invite members of their society as guests.

Yours very truly,

COMMITTEE ON AFFILIATION,

H. R. Westcott, *Chairman*,
E. H. Lockwood, *Secretary*.

A committee of the Connecticut Society of Civil Engineers was present at the meeting.

State of Connecticut.
[SEAL] Office of the Secretary.

ARTICLES OF ASSOCIATION OF THE CONNECTICUT SOCIETY OF CIVIL ENGINEERS, INCORPORATED.

Be it known, That we, the subscribers, do hereby associate ourselves as a body politic and corporate, pursuant to the statute laws of the state of Connecticut regulating the formation and organization of corporations without capital stock, and the following are our articles of association:

Article I.

The name of said corporation shall be The Connecticut Society of Civil Engineers, Incorporated.

Article II.

The purposes for which said corporation is formed are the following, to wit:—the professional improvement of its members; the encouragement of social intercourse among men of practical science and the advancement of engineering in its several branches, to wit:—Civil, Hydraulic, Naval, Sanitary, Mechanical, Electrical, Architectural, Mining, Geological, Metallurgical, and Chemical; the reading and discussion of papers, or the hearing of lectures on any of the above topics relating to engineering science, and the transaction of all business properly belonging to said Society. To acquire, receive, buy, hold, mortgage, sell and convey real and personal property for the use and benefit of this corporation, or to carry out its work and purposes. To do such other and further things, not inconsistent with law, as shall promote the general well-being of the corporation, its members and the engineering profession in general.

Article III.

The said corporation is located in the town and county of New Haven and State of Connecticut.

Dated at New London, Connecticut, this 11th day of August, 1920.

T. A. Scott,
J. Frederick Jackson,
Leon F. Peck,
R. J. Ross,
Incorporators.

County of New London } ss.
State of Connecticut }

August 11, A. D. 1920.

Then and there personally appeared T. A. Scott, J. Frederick Jackson, Leon F. Peck, and R. J. Ross, signers of the foregoing instrument and severally acknowledged the same to be their free act and deed, before me.

Reuben J. Brenner,
Notary Public.

Approved, August 24, 1920.
Frederick L. Perry, *Secretary.*
By Elmer H. Lounsbury.

CONSTITUTION

ARTICLE I.

NAME AND OBJECT.

SECTION 1.—The name of this Society shall be THE CONNECTICUT SOCEITY OF CIVIL ENGINEERS, INCORPORATED.*

OBJECT.

SEC. 2.—The object of this Society shall be the professional improvement of its members; the encouragement of social intercourse among men of practical science, and the advancement of engineering in its several branches, to wit: Civil, hydraulic, naval, sanitary, mechanical, electrical, architectural, mining, geological, metallurgical, and chemical; the reading and discussion of papers, and the hearing of lectures on any of the above topics relating to engineering science, and the transaction of all business properly belonging to said Society.

ARTICLE II.

MEMBERSHIP.

SECTION 1.—The membership of this Society shall consist of Members, Honorary Members and Associate Members.

MEMBERS.

SEC. 2.—Members must be at least twenty-one years of age and have had two years' actual experience in some branch of engineering or surveying, or shall have been graduated from an engineering course in a college or university of recognized standing, and they only shall be entitled to vote or transact business for the Society.

HONORARY MEMBERS.

SEC. 3.—Honorary Members may be as many as the Society shall elect. They shall have no vote, nor shall they be eligible to hold office. They shall have the right to attend all public meetings and to enjoy such other privileges as the Society may see fit to grant, excepting, however, such Honorary Members as may be elected from *active membership*, when they shall retain their right to vote and to hold office.

ASSOCIATE MEMBERS.

SEC. 4.—Any person desiring to become associated with this Society, who is not eligible to active membership, may make application, and if said application receives a favorable report from the Board of Direction, it shall be acted upon by the Society at the next regular meeting, and if said candidate shall receive a majority of the votes cast he shall be declared elected as an Associate Member. Associate Members shall have no vote, nor shall they be eligible for any office.

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*Incorporated under the laws of the State of Connecticut, August, 1920.

ARTICLE III.

OFFICERS AND THEIR DUTIES.

OFFICERS.

SECTION 1.—The officers of the Society shall be a President, two Vice Presidents, a Secretary and Treasurer, an Assistant Secretary, and four Directors, one of whom shall be the last living ex-President.

ELECTION OF OFFICERS.

SEC. 2.—The officers, excepting the Assistant Secretary and the Director who is the last living ex-President, shall be elected at the annual meeting, and shall hold their respective offices until the final adjournment of the meeting in which others are elected and qualified in their places.

PRESIDENT.

SEC. 3.—The President shall preside at all meetings when present. He shall be chairman of the Board of Direction, and of all standing committees, and shall appoint all special committees, unless otherwise ordered by a vote of the Society.

VICE PRESIDENTS.

SEC. 4—In the absence or inability of the President to act, the Senior Vice President present shall perform his duties.

SECRETARY.

SEC. 5.—The Secretary shall attend all meetings of the Society and the Board of Direction, and shall keep the minutes thereof. He shall conduct the general correspondence of the Society, receive communications addressed thereto, and present the same to the proper committees, officers, or meetings. He shall issue notices of all meetings, inform committees of their appointment, and officers and new members of their election. He shall notify all committees of coming meetings and prepare the matters for presentation. He shall keep a complete list of all members, with their addresses and dates of election. He shall publish the annual report. He shall perform such other duties pertaining to his office as may be imposed upon him by the Society or by the Board of Direction, and shall receive a salary to be fixed by the Society.

TREASURER.

SEC. 6.—The Treasurer shall keep the accounts, collect all the funds of the Society and shall deposit the same to the credit of the Society in such depository as may be designated by the Board of Direction. He shall pay all bills, when approved by the President or a majority of the Board of Direction. He shall keep book accounts of his receipts and expenditures, which shall at all times be open to the inspection of the Board. He shall make a duly audited itemized report to the annual meeting. He shall give bonds for the faithful performance of his duties, in such amounts and with such sureties as the Board of Direction may require, and he shall receive such remuneration as the Society may vote to him from time to time. The books shall be audited by Auditors appointed by the Society at its annual meeting.

ASSISTANT SECRETARY.

SEC. 7.—The Assistant Secretary shall be appointed annually by the President, and his duties shall be such as would pertain to the office of executive secretary.

BOARD OF DIRECTION.

SEC. 8.—This Board shall consist of seven members: the last living ex-President, ex-officio; a President; a First and Second Vice President; and three Directors. The President and two Vice Presidents shall be elected annually to serve one year. One Director shall be elected each year to serve for three years, and he shall not be eligible for reëlection to that office until one year has elapsed after his term of office has expired.

The President or one of the Vice Presidents shall preside at all meetings of the Board in the order of seniority. In the absence of all of these officers, a chairman *pro tem.* may be appointed for the meeting.

Four members shall constitute a quorum for the transaction of business.

ARTICLE IV.

ELECTIONS.

OFFICERS, WHEN ELECTED.

SECTION 1.—At each annual meeting the Society shall elect by ballot a President, two Vice Presidents, a Secretary and a Treasurer, to serve one year, and a Director to serve three years.

NOMINATIONS, HOW MADE.

SEC. 2.—A nominating blank, containing a list of officers to be voted for, shall be sent by the Secretary to each member, at least sixty (60) days before the day of the annual meeting. The nominations for officers shall be returned to the Secretary in an envelope endorsed with the member's signature, within twenty-one (21) days from the date upon which the blanks were mailed to members, and shall be delivered by him, unopened, to the Board of Direction at a meeting to be held by them to canvass such nominations.

A member nominated for an office by as many as ten (10) other members may become a candidate for that office. If a member be nominated for more than one office, he shall be considered as having been nominated for that office for which he received the most nominating ballots.

If no member receives ten (10) nominating ballots for an office, or if for any reason there should be no candidate for an office, the Board of Direction shall nominate at least two candidates for that office.

All nominees for office shall be notified at once by the Secretary of their nomination and, unless the Secretary receives a prompt declination, it shall be assumed that they have accepted such nomination.

ELECTIONS, HOW CONDUCTED.

SEC. 3.—At least twenty-one (21) days before the annual meeting the Secretary shall send each member a ballot, containing the names (arranged alphabetically) of the candidates for each office. This shall be accompanied by an envelope addressed to the Secretary, with a blank space on the back for the signature of the member voting, also a blank envelope carrying no mark for recognition.

Each member shall signify his choice by placing a cross opposite each name voted for, or by writing the names, and shall return his ballot to the Secretary in two sealed envelopes; the inner one to be left entirely blank, and the outer one endorsed with signature of sender.

Ballots may be sent by mail to the Secretary or handed to him directly. The Secretary shall deliver the bollots, unopened, to the tellers appointed by the presiding officer.

The polls will close at eleven o'clock in the morning of the day of the regular annual business meeting of the Society.

MEMBERS IN ARREARS CANNOT VOTE.

SEC. 4.—It shall be the duty of the Treasurer to furnish the tellers with an alphabetical list of members in arrears for dues for two years or more, and no vote from a member so in arrears shall be counted. Ballots received from such members shall be returned to them unopened with a statement of the reason for such action.

PLURALITY ELECTS.

SEC. 5.—The candidate for each office receiving a plurality of the votes shall be declared elected. In case of a tie vote, the meeting shall proceed to vote by ballot for the candidates who are tied.

NOTIFICATION.

SEC. 6.—The Secretary shall officially notify in writing each officer of his election.

Officers so elected shall qualify and assume their duties immediately after the adjournment of the meeting at which they are elected, and shall hold office until their successors are duly elected and qualified.

VACANCIES.

SEC. 7.—Vacancies occurring for any cause in the list of officers shall be filled by the Board of Direction.

ELECTION OF MEMBERS.

SEC. 8.—Each application shall be announced on the notices for the next meeting after it is received, shall then be considered by the Board of Direction, and, if approved, shall be presented to the Society for ballot at a regular meeting. If a candidate receives a majority of the ballots, he shall be declared elected. In case of rejection, no minute shall be published, but the Secretary shall notify the applicant by letter.

APPLICATION FOR MEMBERSHIP.

SEC. 9.—All applications for membership or for transfer from one grade of membership to another, shall be made by a regular form, to be secured from the Secretary, and to be endorsed by three Members. This form shall contain, immediately over the signature of the applicant, a clause in which the applicant shall agree that if elected he will be governed in all Society matters by the Constitution and By-Laws, and will forward the interests of the Society at all times.

ARTICLE V.

MEETINGS.

ANNUAL MEETINGS.

SECTION 1.—There shall be a *regular annual meeting* held on the third Tuesday of February of each year, at such place as may be selected by the Board of Direction, of which due notice shall be given by the Secretary.

MEETINGS, HOW CALLED.

SEC. 2.—Special meetings may be called by the President and, when so called, notice of the meeting specifying the business thereof shall be mailed by the Secretary to the postoffice address of each memeber at least ten days before such meeting shall be held. Special meetings shall be called by the President on written application of any ten (10) members.

QUORUM.

SEC. 3.—Ten per cent. of the membership shall constitute a quorum for the transaction of ordinary business, except for the election of officers or for voting on amendments to the Constitution or By-Laws, which shall require fifteen per cent.

ARTICLE VI.

DUES.

SECTION 1.—The annual dues of members and associate members shall be four ($4.00) dollars per year, payable in advance at the annual meeting.

Members elected at any time of the year shall pay full dues for that year.

SEC. 2.—Honorary Members shall pay no annual dues.

SEC. 3.—The Board of Direction shall have power to remit dues when, in their opinion, it is for the best interest of the Society.

Sec. 4.—Active and associate members who have reached the age of seventy years and who have paid dues as such for twenty-five years shall be exempt from further dues. Active and associate members who have paid dues as such for thirty-five years shall be exempt from further dues.

ARTICLE VII.

DEPRIVATION OF MEMBERSHIP

Section 1.—Any member whose dues shall remain unpaid for one (1) year shall be notified by the Treasurer, by sending by registered mail a bill for dues in arrears, on the face of which bill shall be printed the sections of the Constitution covering such cases. If the dues are not paid within thirty (30) days after such notification, the matter shall be presented to the Board of Direction, who shall have power to drop such member from the roll.

RESIGNATIONS.

Sec. 2.—Resignations must be submitted in writing to the Secretary, and may be accepted by the Board of Direction when all indebtedness to the Society has been discharged.

Sec. 3.—All charges against any member shall be investigated by the Board of Direction before being submitted to the Society.

Any member may be expelled for conduct which may be deemed prejudicial to the Society, by a two-thirds vote of the Members present at a business meeting; provided, that not less than fifteen (15) vote for expulsion, and that such member shall have had one month's notice of the charges preferred against him and of the time appointed for their consideration. All charges must fully set forth the offense or offenses alleged, and must be signed by the members preferring them. An attested copy must be furnished the accused, who shall be entitled to be present and to be heard in defense, in person or by attorney, at all meetings at which the charges are investigated, except during the time when a final vote is being taken.

ARTICLE VIII.

AMENDMENTS TO CONSTITUTION.

Section 1.—Proposed amendments to this Constitution must be presented in writing at a regular business meeting of the Society, and signed by at least three members. Amendments so presented shall be read at the meeting and a copy filed with the Secretary at the same time. At the meeting when presented the proposed amendments may be discussed and amended, and if approved by the meeting shall be submitted to a letter ballot by the Society at the next regular business meeting.

Sec. 2.—At any regular business meeting the amendments previously proposed, according to Section 1, may be voted upon by letter ballot. These ballots shall be sent out with the call for the meeting and shall have the proposed amendment, together with the section of the present Constitution covering the point in question, printed upon the ballot. With the ballot shall also be sent an envelope directed to the Secretary and marked "Ballot on Amendment." The Secretary shall keep these letters unopened and present to the presiding officer all replies received up to the hour of closing the polls. Tellers shall be appointed by the presiding officer, who shall open and count all ballots. The result shall be announced at the meeting by the presiding officer. Two-thirds of the ballots cast will be necessary for the adoption of an amendment.

Sec. 3.—The Board of Direction is authorized to number the Articles and Sections of the Constitution and By-Laws to correspond with any changes that may be made.

BY-LAWS.

MEETINGS.

1. In addition to the regular annual meeting, as provided by the Constitution, the Society shall hold at least one other general meeting, and may hold such other meetings as may be called by the President for the presentation of papers, lectures or addresses, for visiting engineering works of interest, or for purely social purposes.

GENERAL ORDER OF BUSINESS AT ANNUAL MEETING.

2. The following general order of business shall be observed at annual meetings:

1. Presentation of, and action upon, minutes of last meeting.
2. Report of Board of Direction.
3. Report of Secretary.
4. Report of Treasurer.
5. Report of any Special Committees.
6. Election of new members.
7. Election of officers.
8. Address of President.
9. Miscellaneous business.
10. Papers, lectures or addresses.
11. Adjournment.

BUSINESS MEETING—ORDER.

3. The following general order shall be observed at Business Meetings:

1. Presentation of, and action upon, minutes of last meeting.
2. Miscellaneous announcements.
3. Stated business.
4. Adjournment.

4. Actual personal transportation expenses incurred by the Secretary in attending meetings shall be paid from the Society treasury, upon approval of the President or two members of the Board of Direction.

5. In the election of Honorary Members, a unanimous vote is necessary to elect.

6. The Society may at any time, duly named for the purpose, enact By-Laws for the future guidance, consonant with the Constitution. These By-Laws may be amended or repealed at any meeting, in the call for which meeting a copy of the proposed amendment or addition shall have been printed and sent to each member with the said notice.

PARLIAMENTARY RULES.

8. In all questions arising at any meeting, involving parlimentary rules, not provided for in these By-Laws, Roberts' Rules of Order shall be the governing authority.

VISITORS.

9. Visitors may be admitted to meetings under such rules as the meeting may prescribe.

10. All forms, such as blanks for application for membership, ballots for officers, ballots on amendments to Constitution or By-Laws, and other necessary blanks for the conduct of the business of the Society, shall be prepared by the Secretary and approved by the Board of Direction.

CHARTER MEMBERS OF THE SOCIETY

HONORARY.

Prof. John E. Clark*	April, 1884
George H. Frost*	April, 1884

ACTIVE.

B. Hull*	April, 1884
E. P. Augur	April, 1884
C. H. Bunce*	April, 1884
L. W. Burt*	Jan. 13, 1885
C. E. Chandler	April, 1884
R. S. Hulbert	April, 1884
C. M. Jarvis*	April, 1884
H. J. Kellogg	April, 1884
F. W. La Forge	Jan. 13, 1885
W. B. Palmer	Jan. 13, 1885
S. C. Pierson*	Jan. 13, 1885
A. W. Rice	April, 1884
William G. Smith	April, 1884
Nelson J. Welton*	April, 1884

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* Deceased.

Alphabetical List of Members.

With Addresses and Dates of Election.

Members are particularly requested to inform the Secretary at once of any changes in address.

HONORARY MEMBERS.

*AUGUR, Edwin P. (April, 1884), 59 Broad St., Middletown, Conn. P. O. Box [illegible]

BRECKENRIDGE, Lester P. (Feb. 9, 1914), Director Mason Laboratory, Yale University, New Haven, Conn.

*CHANDLER, Charles E. (April, 1884), Chandler & Palmer, City Engineers, 161 Main St., Norwich, Conn.

CHITTENDEN. Prof. Russell H. (April 20, 1901), Dean of Sheffield Scientific School of Yale University, New Haven, Conn.

FITZGERALD, Desmond (Jan. 8, 1901), Consulting Engineer, Brookline, Mass.

FULLER, William B. (Feb. 12, 1908), Consulting Engineer, [illegible] Nassau St., New York.

HADLEY, Dr. Arthur T. (April 20, 1901), President Emeritus Yale University, 93 Whitney Ave., New Haven, Conn.

HAUPT, Lewis M. (Feb. 12, 1907), Consulting Engineer, Cynwyd, Pa.

HAYNES, Edward C. (Jan. 14, 1890), 185 Plymouth Ave., Buffalo, N. Y.

*HULBERT, R. S. (April, 1884), Division Engineer, State Highway Department, 267 Rockwell St., Winsted, Conn.

*KELLOGG, Henry J. (April, 1884), First Assistant City Engineer, New Haven, Conn.

*LA FORGE, Frederick W. (Jan. 13, 1885), U. S. Engineer, Fort H. G. Wright, New London, Conn.

LUTHER, Flavel S. Jr. (Feb. 9, 1904), former President Trinity College, Hartford, Conn.

*PALMER, William B. (Jan. 13, 1885), Palmer & Goodell, Civil Engineers and Surveyors, 211 State St., Bridgeport, Conn.

PETTEE, William E. (Jan. 10, 1899), Civil Engineer, Salisbury, Conn.

*RICE, Arthur W. (April, 1884), Retired, 29 Cedar St., New Britain, Conn.

SKINNER, Frank W. (Jan. 9, 1900), Editorial Staff of the Engineering Record, 22 Vesey St., New York.

*SMITH, William G. (April, 1884), Superintendent of Water Works, Waterbury, and *for mail*, 17 First Ave., Waterbury, Conn.

MEMBERS.

ALDERSON, [illegible] (Jan. [illegible]), Civil Engineer, [illegible] Farmington Ave., Hartford, Conn.

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* Made Honorary Members by vote taken Feb. [illegible]

ALLEN, George B. (Aug. 12, 1908), Mill Architect and Civil Engineer, 52 Vanderbilt Ave., New York, N. Y., or 132 Lyncraft Road, New Rochelle, N. Y.

AMRHYN, Gustave X. (Associate Member, Feb. 9, 1904), Superintendent of Parks, City Hall, New Haven, Conn.

ANDREWS, Ralph J. (Feb. 11, 1913), Civil Engineer, 49 Elmwood Ave., Waterbury, Conn.

ARNOLD, Walter T. (Aug. 8, 1917), Civil Engineer and Architect, H. Wales Lines Co., Meriden, and *for mail,* 105 Elm St., Meriden, Conn.

ARTHUR, George D. (Feb. 17, 1920), with William H. Arthur, Constructing Engineer, Stamford, Conn. Lives in Glenbrook, Conn.

ARTHUR, William H. (Feb. 17, 1920), Constructing and Engineering, Stamford, Conn. Lives in Glenbrook, Conn.

AUGUR, Edwin P. See "Honorary Members."

AYMAN, Nathan (Feb. 14, 1912), Assistant Engineer, 18 City Hall, New Haven, and *for mail,* 635 Congress Ave., New Haven, Conn.

AZHDERIAN, Reuben B. (Feb. 12, 1907), Assistant Engineer for Passaic Valley Sewerage Commissioners, Newark, and *for mail,* P. O. Box 117, Newark, N. J.

BACKES, William J. (Feb. 8, 1910), Engineer, Maintenance of Way, N. Y., N. H. & H. R. R., 139 Fountain St., New Haven, Conn.

BACON, Arthur W. (Feb. 9, 1904), Hall & Bacon, Civil Engineers, New Britain, Conn.

BALDWIN, Clarence B. (Feb. 17, 1920), Designer of Structural Steel, Berlin Construction Co., Berlin, Conn. Box Q, Kensington, Conn.

BANTA, D. Schuyler (Aug. 23, 1905), Civil Engineer, N. Y., N. H. & H. R. R., New Haven, and *for mail,* 217 Alden Ave., New Haven, Conn.

BARKER, Edward B. (Feb. 17, 1920), Engineering Force, West Hartford, Conn., and *for mail,* P. O. Box 75, West Hartford, Conn.

BARKER, George P. (Aug. 13, 1913), Construction Engineer, H, Wales Lines Co., Meriden, and *for mail,* 163 Elm St., Meriden, Conn.

BARKER, William H. (Aug. 10, 1904), Expert in Patent Causes, 160 Broadway, New York.

BARLOW, James E. (Feb. 21, 1922) City Manager, City Hall, New London, Conn.

BARNEY, Samuel E. (Jan. 9, 1900), Assistant Professor Civil Engineering, Sheffield Scientific School, Yale University, New Haven, Conn.

BARRY, W. Vincent (Feb. 11, 1913), Bridge Engineer, City Engineer's Office, or 174 Spring St., New Haven, Conn.

BARTLETT, Burton W., (Feb. 15, 1921), Treasurer and Manager, The Bent-Bartlett Co., 43 Ann St., Hartford, Conn.

BARTLETT, Frank R. (Aug. 17, 1909), Estimator, 26 Church St., Meriden, and *for mail,* 21 Lambert Ave., Meriden, Conn.

BEACH, C. Edward (Jan. 10, 1893), Civil Engineer, West Hartford, and *for mail.* Beach & Co., P. O. Drawer 13, Hartford, Conn.

BEARD, Elmer Hipple (Feb. 18, 1919), Glenbrook P. O., Stamford, Conn.

BEARD, Theodore W. (Feb. 10, 1914), Construction Engineer, Chase Metal Works, Department 900, Waterville, and *for mail,* 71 Wooster St., Shelton, Conn.

BEARDSLEY, Allen M. (Feb. 18, 1919), 37 Beardsley Ave., Startford, Conn.

BECKLEY, Chester A. (Aug. 11, 1920), Engineer, The Merritt-Chapman & Scott Corporation, New London, and *for mail,* 292 Pequot Ave., New London, Conn.

BEELER, Cresson L. (Feb. 19, 1918), Civil Engineer, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

BEERS, Howard L. (Feb. 18, 1919), Eastern Engineering & Construction Co., Bridgeport, and *for mail,* 134 Blakeman Pl., Stratford, Conn.

BEIN, Howard K. (Feb. 20, 1917), Engineering Department, U. S. Rubber Co., 509 Chapel St., New Haven, Conn.

BENEDICT, Eric W. (Feb. 21, 1922), City Engineer's Office, Waterbury, Conn., or R. D. 4, Waterbury.

BENNETT, Charles J. (Aug. 14, 1906), State Highway Commissioner, 12 Washington St., or P. O. Drawer 12, Hartford, Conn.

BERGER, Ellsworth (Aug. 11, 1922), [illegible] Sixth Ave., Newark, N. J.

BILDERBECK, George L. (Feb. 9, 1915), Bilderbeck & Langdon, Inc., Engineers and Architects, Barrows Bldg., New London, Conn.

BISHOP, Carlton T. (Aug. 13, 1913), Assistant Professor Structural Engineering, Sheffield Scientific School, Yale University, New Haven, and *for mail*, 284 Alden Ave., New Haven, Conn.

BITTNER, Samuel A. (Feb. 15, 1921), Estimating and Designing Engineer, Glenwood Park, New London, Conn.

BLACK, Frank L. (Feb. 18, 1919), 1777 Noble Ave., Bridgeport, Conn.

BLAIR, Clarence M. (Aug. 10, 1914), Civil Engineer, A. B. Hill, 100 Crown St., New Haven, and *for mail*, 785 Edgewood Ave., New Haven, Conn.

BLAKESLEE, Albert D. (Aug. 8, 1916, Active, Feb. 19, 1918), Superintendent, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, and *for mail*, 100 Dwight St., New Haven, Conn.

BLAKESLEE, Clarence (Jan. 9, 1900), Civil Engineer and Contractor, 58 Waverly St., New Haven, Conn.

BLAKESLEE, Harold L. (Feb. 11, 1913), Superintendent, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, and *for mail*, 596 George St., New Haven, Conn.

BLAKESLEE, Miles Grant (Feb. 19, 1918), Civil Engineer, C. W. Blakeslee & Sons, 58 Waverly St., or 501 George St., New Haven, Conn.

BLATCHLEY, William J. (Aug. 10, 1904), Treasurer, New Haven Engineering & Construction Co., 82 Church St., New Haven, Conn.

BLOOM, Clarence E. (Aug. 11, 1920), The J. H. Grozier Co., Hartford, and *for mail*, 469 Prospect Ave., Hartford, Conn.

BOLTON, William M. (Aug. 12, 1915), Civil Engineer, 18 City Hall, New Haven, and *for mail*, 401 Ellsworth Ave., New Haven, Conn.

BOWEN, J. Frank (Feb. 14, 1911), Superintendent Roads and Bridges and Town Engineer, South Manchester, Conn.

BOWMAN, Charles A. (Feb. 15, 1921), City Engineer's Office, or 705 Dixwell Ave., New Haven, Conn.

BOYLAN, James E. (Feb. 14, 1912), Contracting Engineer, Berlin Construction Co., Berlin, and *for mail*, Middletown, Conn.

BRADLEY, Edward F. (Feb. 9, 1915), Assistant Engineer, N. Y., N. H. & H. R. R., 37 Windsor St., Waterbury, Conn.

BRADY, John J. (Feb. 21, 1922), Civil Engineer, 60 Laurel St., Waterbury, Conn.

BRAINARD, Frank S. (Aug. 9, 1921), Assistant Engineer, Distribution Division, Hartford Waterworks. 246 Palm St., Hartford, Conn.

BRENNER, Reuben J. (Feb. 17, 1920), Assistant Engineer, City Engineer's Office, New Haven, Conn.

BREWER, Willard S. (Feb. 12, 1907), Division Engineer, City Engineer's Office, Hartford, and *for mail*, 25 Salem St., Hartford, Conn.

BRINSMADE, Daniel E. (April 20, 1901), President and Treasurer, Ousatonic Water Co., Shelton, and *for mail*, P. O. Drawer O, Derby, Conn.

BROSNAN, James T. (Aug. 7, 1918), 24 East Pearl St., New Haven, Conn.

BRODERICK, Clement M. (Feb. 17, 1920), Department of Engineering, Hartford, and *for mail*, 15 Alden St., Hartford, Conn.

BROWN, Charles B. (Aug. 14, 1907), Professor of Railroad Engineering, University of Maine, Orono, Maine, and *for mail*, 1470 Chapel St., New Haven, Conn.

BROWN, Charles O. (Jan. 11, 1898), City Engineer, Danbury, Conn.

BROWN, Raymond J. (Feb. 15, 1916), Draftsman, The Foamite Firefoam Co., 200 Fifth Ave., New York City.

BROWNE, George E. (Feb. 21, 1922), City Engineer's Office, Waterbury, Conn., or Bantam, Conn.

BUCK, Henry Robinson (Jan. [illegible], [illegible]), Pres., Buck & Sheldon, Inc., Consulting Engineers, 60 Prospect St., Hartford, Conn.

BUELL, Carleton W., (July 25, 1922), City Engineer, Bristol, Conn.

BURGESS, Harold T. (Feb. 15, 1916), Civil Engineer, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, and *for mail,* 201 South Fourth St., Meriden, Conn.

BURGHARDT, Wallace W. (Feb. 13, 1906), Engineer, Canaan, Conn.

BURROS, Aaron, (Feb. 19, 1918), Civil Engineer, Care of John Burros, 1772 East 19th St., Brooklyn, N. Y.

BURT, Luther Harold (Aug. 14, 1900), Member L. W. Burt & Son, Civil and Consulting Engineers, 721 Main St., Hartford, Conn.

BUSCHOR, Emli C. (Jan. 10, 1893), Assistant Engineer, Rapid Transit Subway Construction Co., 165 Broadway, New York, and *for mail,* 324 East Second Ave., Roselle, N. J.

BUSH, Edward W. (Jan. 10, 1899), Member State Board of Engineers having supervision over Dams and Reservoirs, 137 North Whitney St., Hartford, Conn.

BUSHELL, Arthur W. (Feb. 20, 1917), 309 Thayer Building, Norwich. Conn.

BUSSING, Harry B., Jr. (Feb. 21, 1922), Department Maintenance of Way, N. Y., N. H. & H. R. R., 12 Jefferson St., Norwalk, Conn, or 150 Capitol Ave., Hartford, Conn.

CADWELL, William H. (May 31, 1893), Civil Engineer, 213 Main St., New Britain, Conn.

CAHN, Alexander (Jan. 9, 1900), Civil Engineer, 839 Chapel St., New Haven, Conn.

CAIRNS, Robert A. (Aug. 29, 1890), Sanitary and Hydraulic Engineer and City Engineer, Waterbury, Conn.

CALDWELL, Fred E. (Feb. 17, 1920), Portland Cement Association, Chicago, Ill., and *for mail,* 67 Midland Ave., East Orange, N. J.

CAMPBELL, Carrol A. (Feb. 9, 1909), Director of Public Works, Middletown, Conn.

CANNON, Dana H. (Feb. 17, 1920), Secretary and Treasurer, The Industrial Construction Co., 721 Main St., Hartford, Conn.

CAREY, Frank J. (Associate Member, July 25, 1922), The Larkin-Carey Co., 166 Brewery St., New Haven, Conn.

CARLISLE, H. E. (Jan. 9, 1900), Conduit Engineer, Southern New England Telephone Co., New Haven, Conn.

CARMALT, L. J. (Feb. 19, 1918), Civil and Consulting Engineering, 129 Church St., New Haven, Conn.

CARROLL, Charles D. (Feb. 14, 1911), Civil Engineer, Rivers, Harbors and Bridges Commission, New London, and *for mail,* 914 Bank St., New London, Conn.

CHAFFEE, Robert N. R. (Aug. 15, 1916), Civil Engineer, 1314 Cleveland Boulevard, Caldwell, Idaho.

CHANDLER, Charles E. See "Honorary Members."

CHAPMAN, Charles H. (Associate Member, Feb. 15, 1916), Manager Waterbury Division, Connecticut Company, Waterbury, and *for mail,* P. O. Box 1124, Waterbury, Conn.

CHASE, Charles F. (March 30, 1900), Chief Engineer, Berlin Construction Company, Berlin, or 241 West Main St., New Britain, Conn.

CHILD, Jonathan H., (Aug. 9, 1921), Superintendent of Construction, R. Wallace & Sons Manufacturing Co., 91 North Main St., Wallingford, Conn.

CLARK, Albert L. (Feb. 17, 1920), Draftsman, The Connecticut Co., or 1631 Chapel St., New Haven, Conn.

CLARK, Herbert G. (July 18, 1899), Assistant Engineer, City Engineer's Office, Hartford, and *for mail,* 4 West Clay St., Hartford, Conn.

CLARK, Jay H. F. (Feb. 17, 1920), Assistant Engineer, Connecticut Co., Madison, Conn.

CLARK, Robert W. (Feb. 21, 1922), President, Clark Construction Co., 168 Grant St., Waterbury, Conn.

CLARK, Roscoe N. (July 18, 1899) City Engineer, Hartford, Conn.

CLARK, William S. (July 14, 1899), Civil Engineer, The York Hill Trap Rock Quarry Co., State & Broad Sts., Meriden, Conn.

CLARKE, Stanley N. (Aug. 16, 1911), Civil Engineer, Milford, Conn.

CLARKE, Vincent B. (Feb. 9, [illegible]), City Engineer, Ansonia, and *for mail*, 29 Jackson St., Ansonia, Conn. P. O. Box 582.

CLARKE, Waldo E. (Feb. 10, 1914), Resident Engineer, Rivers, Harbors, and Bridges Commission, New London, and *for mail*, 883 Montauk Ave., New London, Conn.

CLEMENTS, Chauncey H. (Aug. 9, [illegible]), In charge of Electrolysis Tests, [illegible] Connecticut, 25 Irving St., New Haven, Conn.

CLINTON, William A. (Aug. 9, 1921), Steel Fabrication and Erection, P. O. Box [illegible], or 127 Sargent St., Hartford, Conn.

CLOSE, F. Perry (Feb. 19, 1918), Division Engineer, City Engineer's Office, Hartford, Conn.

CLOUGH, Earl E. (Aug. 9, 1921), Connecticut National Pavements, Inc., 109 Court St., New Haven, Conn.

CODAIRE, Alfred H. (Feb. 15, 1916), Collinsville, Conn.

COE, Frederick L. (Feb. 14, 1911), Assistant Engineer, City Engineer's Office, New Haven, Conn.

COE, Theodore I. (Jan. 9, 1900), Architect, 32 West 40th St., New York, N. Y.

COLBY, Walter E. (Feb. 21, 1922), Civil Engineer, 69 Branch St., Waterbury, Conn.

COLE, Clinton L. (Feb. 9, 1904), Bliss & Cole, Appraisers, Connecticut Mutual Bldg., Hartford, Conn.

COLGAN, Alfred P. (Feb. 9, 1915), Civil Engineer, 44 Beacon St., Waterbury, Conn.

COLLINS, Edward T. (Feb. 11, 1913), U. S. Inspector, Engineering Department, or 298 Huntington St., New London, Conn.

COLLINS, Harry C. (July 18, 1899), Contracting Engineer, Berlin Construction Co., Springfield, Mass.

COLLINS, John F. (July 25, 1922), City Engineer's Office, Willimantic, or 195 Jackson St., Willimantic, Conn.

COLVIN, Allan D. (Feb. 2, 1922), General Manager Hartford Electric Co., 266 Pearl St., Hartford, Conn.

COMSTOCK, Lewis B. (Aug. 10, 1904), Civil Engineer, Comstock Block, East Hartford, Conn.

CONE, Joseph W. (Aug. 12, 1908), Civil Engineer, P. O. Box 562, Greenwich, Conn.

CONNELLY, Harold M. (Feb. 17, 1920), Connecticut State Highway Commission, 769 Wethersfield Ave., Hartford, Conn.

CONNOR, M. A. (Feb. 14, 1911), Civil Engineering, 347 Wethersfield Ave., Hartford, Conn., or Connor & Poriss, General Contractors, 54 Church St., Hartford, Conn.

COOKE, Charles W. (Feb. 21, 1922), City Engineer's Office, or 9 Madison St., Hartford, Conn.

CRAIG, James (Feb. 18, 1919), Elmwood, Conn.

CRAM, Roy C. (Feb. 8, 1910), Assistant Engineer, Way and Structure, Brooklyn Rapid Transit Co., Brooklyn, and *for mail*, 412 Ocean Ave., Brooklyn, N. Y.

CRANDALL, George K. (Jan. 11, 1887), Civil Engineer, 154 State St., New London, Conn.

CRAWLEY, Ernest W. (Feb. 14, 1912), U. S. Junior Engineer, U. S. Engineer's Office, New London, and *for mail*, 60 Vauxhall St., New London, Conn.

CROSS, Robert Ellis (Feb. 15, 1916), Department of Engineering, Municipal Building, Hartford, or 315 Pearl St., Hartford, Conn.

CURRY, [illegible] (Feb. [illegible]), Consulting Engineer, 78 Chestnut Ave., Waterbury, Conn.

CURTIS, Abner L. (Feb. 14, 1912), District Engineer of Construction, N. Y., N. H. & H. R. R. Co., Pawtucket, R. I., and *for mail*, 85 Mather St., Whitneyville, Conn.

CURTISS, Charles D. (Aug. [illegible]), Civil Engineer, 49 Church St., Naugatuck, Conn.

CURTIS, Fayette S. (Jan. 9, 1900), Vice President, N. Y., N. H. & H. R. R., Boston, Mass.

DABOLL, Ernest C. (Feb. 14, 1911), Civil Engineer, Groton, Conn.

DABOLL, Loren E. (Jan. 8, 1895), Civil Engineer, 98 State St., New London, and *for mail*, P. O. Box 356, New London, Conn.

DAGGETT, Harry E. (Aug. 9, 1921), Civil Engineer, 175 Benton St., Hartford, or 308 Hall & Lewis Bldg., Meriden, Conn.

DARGAN, Edward L. (Feb. 18, 1919), Connecticut State Highway Department, 446 Beechwood Ave., Bridgeport, Conn.

DARROW, Courtland R. (Jan. 8, 1895), Highway Commissioner, New London, Conn.

DAVIS, Arthur L. (July 18, 1899), Division Manager, American Bridge Co., 30 Church St., New York, N. Y.

DAVIS, Frank J. (Feb. 14, 1911), Superintendent, Ansonia Water Co., Ansonia, and *for mail,* 51 Franklin St., Ansonia, Conn.

DAVIS, Frederick A., Jr. (Aug. 11, 1920), Landscape Engineer, Park Development, 185 Church St., New Haven, Conn.

DAY, Lester S. (July 25, 1922), Division Construction Foreman, S. N. E. Telephone Co., 41 Lake St., Hamden, Conn.

DEGNAN, James F. (Associate Member, Feb. 17, 1920), Secretary, C. A. Sibley Co., Contracting Engineer, 902 Chapel St., New Haven, Conn.

DE MAY, Winifred W. (Feb. 17, 1920), City Engineer's Office, Hartford, Conn.

DEMING, Charles R. (Feb. 20, 1917), Chief Draftsman, Lockwood, Greene & Co., 245 State St., Boston, Mass., and *for mail,* 179 Belmont St., Belmont, Mass.

DePEYSTER, Frederick (Sept. 3, 1891), General Manager, The Brainerd, Shaler & Hall Quarry Co., Portland, Conn.

DEYO, Solomon LeF. (Jan. 9, 1900), Chief Engineer, New York Rapid Transit Subway Construction Co., New York City, and *for mail,* 2108 Fifth Ave., New York City.

DOANE, Royal B. (Feb. 20, 1917), Maple Hill, New Britain, Conn.

DOERR, John H. (Feb. 11, 1913), Roadmaster, Connecticut Co., 129 Frost Road, Waterbury, Conn.

DOMAN, Joseph (Feb. 2, 1922), Assistant Sanitary Engineer, Connecticut Department of Health, 602 Broad St., Hartford, Conn.

DONAGHUE, Edward L. (Feb. 19, 1918), Civil Engineer, Department of Engineering, Hartford, Conn.

DONNELLY, Albert L. (Feb. 14, 1912), Division Engineer, Connecticut Company, 185 Church St., New Haven, Conn.

DORRANCE, William T. (Feb. 17, 1920), Designing Engineer, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

DU BRUEIL, J. M. (Aug. 2, 1918), 248 Whalley Ave., New Haven, Conn.

DUFFY, Joseph M. (Associate Member, Feb. 17, 1920), 58 Dorchester Ave., Boston 27, Mass.

DUNHAM, W. R., Jr. (Feb. 12, 1907), 69 Stanley St., New Haven, Conn.

DUNN, Herbert L. (Aug. 14, 1914), Civil Engineer, 172 Willetts Ave., New London, Conn.

EASTERBROOK, Frederick J. (March 30, 1900), Resident Engineer, American Brass Co., Waterbury, Conn. 82 York Sq., New Haven, Conn.

ECKLE, John N. (Feb. 9, 1915), Civil Engineer, 283 Union Ave., West Haven, Conn.

EDDY, Charles W. (Jan. 9, 1900), Assistant Engineer, Waterbury Water Supply, P. O. Box 244, Thomaston, Conn.

EDWARDS, Frederick H. (Associate Member, July 25, 1922), P. O. Box 324, Meriden, Conn.

ELLSWORTH, F. H. (March 30, 1900), Division Engineer, N. Y., N. H. & H. R. R. Co., Passenger Station, Hartford, Conn.

ELTON, Herbert C. (Feb. 9, 1915), Civil Engineer, 78 Rowsley St., or 886 Main St., Bridgeport, Conn.

ELWELL, Charles Clement (Feb. 8, 1910), Public Utilities Commissioner, New Haven, and *for mail,* 71 College St., New Haven, Conn.

ENNIS, William J. (Aug. 9, 1921), Buck & Sheldon, Inc., Hartford, 309 Albany Ave., Hartford, Conn.

EULA, Dominick B. (Feb. 18, 1919), Connecticut State Highway Department, 32 Taylor Ave., South Norwalk, Conn.

EVANS, Lafayette (Feb. 14, 1911), Second Assistant City Engineer, Bridgeport, Conn.

EVERIT, Edward H. (Oct. 11, 1902), Chief Engineer, Southern New England Telephone Co., New Haven, Conn.

FARNHAM, Charles S. (Feb. 9, 1904), Assistant Professor Civil Engineering, Sheffield Scientific School, New Haven, and *for mail,* 211 Norton St., New Haven, Conn.

FERRY, Charles A. (Jan. 9, 1900), Consulting Engineer, 82 Church St., New Haven, Conn.

FIEN, Aaron (Feb. 17, 1920), City Engineer's Office, Hartford, Conn.

FITTZELL, William H. (Associate Member, Feb. 15, 1921), Purchasing and Erection Work, Berlin Construction Co., Berlin, 87 Sefton Drive, New Britain, Conn.

FONES, William A. (Associate Member, Aug. 11, 1920), Resident Vice-President, The Merritt-Chapman & Scott Corporation, or 172 Willetts Ave., New London, Conn.

FORD, Frederick L. (Jan. 12, 1897), Civil Engineer and Contractor, 140 Cottage St., New Haven, Conn.

FRANCIS, George S. (Feb. 19, 1918), Civil Engineer, Department of Engineering, Hartford, and *for mail,* Wethersfield, Conn.

FRECH, John L. (Feb. 20, 1917), Civil Engineer, N. Y., N. H. & H. R. R., and *for mail,* 17 Smith St., West Haven, Conn.

FRENCH, Joseph H. (Feb. 17, 1920), Electrical Engineer, The Eastern Power Co., 362 Main St., Norwich, Conn.

FRITZ, Howard W. (Associate Member, Feb. 21, 1922), City Engineer's Office, Waterbury, Conn., or Allen St., Torrington, Conn.

FULLER, Aubrey D. (Feb. 17, 1920), Scofield & Ford, 952 Main St., Bridgeport, Conn.

GADD, Robert F. (Feb. 17, 1920), Estimator, Engineer, Salesman and General Manager, Levering & Garrigues Co., Hartford, and *for mail,* 76 Kenyon St., Hartford, Conn.

GAGEL, Edward (Jan. 9, 1900), Chief Engineer, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

GAILOR, Chester F. (Feb. 15, 1916), Consulting Engineer, 30 Church St., New York, N. Y.

GAILOR, D. Floyd (Feb. 11, 1913), The Connecticut Co., New Haven, or 1184 Chapel St., New Haven, Conn.

GARDNER, Robert S. (Aug. 11, 1920), District Salvage Officer during the late war, rank Lieut. Commander U. S. N. R. F. Wreckmaster, The Merritt-Chapman & Scott Corporation, New London, Conn.

GEER, E. Selden (Feb. 15, 1916), Safety Engineer, Travelers Insurance Co., Hartford, and *for mail,* 64 Niles St., Hartford, Conn.

GIFFORD, Charles F. (Aug. 9, 1921), Architect, East Hartford, Conn.

GILBERT, William T. (Feb. 17, 1920), Civil Engineer, 170 McKinley Ave., New Haven, Conn.

GILDERSLEEVE, Oliver (Aug. 9, 1921), Superintendent The Gildersleeve Ship Construction Co., Gildersleeve, Conn.

GLADDING, Henry H. (Jan. 9, 1900), Assistant City Engineer, New Haven, Conn.

GOSS, Edward O. (Nov. 29, 1890), Assistant Treasurer, Scovill Manufacturing Co., 117 Pine St., Waterbury, Conn.

GRAVES, Edwin D. (Oct. 25, 1895), Civil Engineer, Hartford, Conn.

GREEN, Walter P. (Feb. 19, 1918), Civil Engineer, Scovill Manufacturing Co., Waterbury, and *for mail,* 15 Plank Road, Waterbury, Conn.

GREENWOOD, Albert H. (Feb. 9, 1904), Greenwood & Noerr, Consulting Engineers, [illegible] Main St., Hartford, Conn.

GREGORY, J. Louis (Aug. 10, 1904), General Contracting, 5 Lake Ave., Greenwich, Conn.

GUYOTT, [illegible] (Feb. [illegible]), Superintendent for the Sperry Engineering Co., 82 Church St., New Haven, 102 Anderson Ave., West Haven, Conn.

HALL, A. Clark (Jan. 8, 1901), Civil Engineer, Bloomfield, Conn.

HALL, Charles Ernest (Feb. 12, 1907), Civil Engineer, Third Ave., Railroad Co., 2396 Third Ave., New York, N. Y.

HALL, William H. (Feb. 12, 1907), New Britain, Conn.

HALTON, William (Associate, Aug. 7, 1918), 527 West Main St., Mt. Vernon, N. Y.

HAM, George C. (Aug. 17, 1909), Civil Engineer, 98 Church St., Naugatuck, Conn.

HAMILL, Charles B. (Feb. 18, 1919), P. O. Box 785, Bridgeport, Conn.

HAMLIN, George E. (Aug. 12, 1915), State Highway Department, Hartford, and *for mail,* 24 May St., Hartford, Conn.

HANS, Alexander Joseph (Feb. 12, 1907), Chief Engineer, Piping Rock Estates, Locust Valley, Long Island, N. Y.

HART, Jonathan T. (Feb. 15, 1916), Superintendent, Berlin Construction Co., Berlin, Conn.

HARTE, Charles Rufus (Aug. 10, 1904), Construction Engineer, The Connecticut Company, New Haven, Conn.

HASTINGS, Frederick B. (Associate Member, Feb. 10, 1903), Frederick B. Hastings & Co., Wood Ave., Bridgeport, Conn.

HAVEN, Ralph DeW. (Feb. 8, 1910), Civil Engineer, 245 East Ave., East Norwalk, Conn.

HAWLEY, Arthur S. (Feb. 11, 1902), C. W. Blakeslee & Sons, New Haven, Conn., or 193 Maple St., New Haven, Conn.

HEAD, Orrin W, (Feb. 15, 1916), City Engineer, Concord, N. H.

HELLWIG, Gustav A. (Feb. 17, 1920), Assistant Engineer, N. Y., N. H. & H. R. R. Real Estate Department, 306 Capitol Ave., Bridgeport, Conn.

HENDERSON, John T. (July 18, 1899), Chief Engineer, Connecticut River Bridge and Highway District, 756 Main St., Hartford, Conn.

HERBST, Abram W. (Associate, Aug. 7, 1918), General Manager, The New England Slag Co., Canaan, Conn.

HEUSTED, Charles W. (Associate Member, Feb. 17, 1920), The Berlin Construction Co., Berlin, and *for mail,* 126 Warrenton Ave., Hartford, Conn.

HEWLETT, William S. (Associate Member, Feb. 20, 1917), 886 Main St., Bridgeport, Conn.

HICKEY, William F. (Feb. 9, 1909), Care of Carnegie Steele Co., 129 Franklin St., Boston, Mass.

HILL Albert B. (Jan. 9, 1900), Consulting Civil Engineer, 100 Crown St., or P. O. Box 549, New Haven, Conn.

HILLHOUSE, T. Curtis (Feb. 14, 1912), Civil Engineer, Bureau of Engineering, New Haven, Conn.

HOHENTHAL, Emil L. G., Jr. (Aug. 13, 1913), 33 Ridgewood St., South Manchester, Conn.

HOLBROOK, C. G. Harold (Feb. 13, 1912), C. W. Blakeslee & Sons, or 417 Alden Ave., New Haven, Conn.

HOLLIS, Eben C. (Feb. 19, 1918), 36 Silver St., Waterbury, Conn.

HOLLEY, Irving B. (Associate Member, Feb. 17, 1920), General Contracting, 45 Holley St., Torrington, Conn.

HOSLEY, Robert M. (Aug. 23, 1905), Assistant Engineer, N. Y., N. H. & H. R. R. Co., New Haven, and *for mail,* 304 Ferry St., New Haven, Conn.

HOWARD, Frank W. (Feb. 17, 1920), City Engineer's Office, Bridgeport, and *for mail,,* 643 Central Ave., Bridgeport, Conn.

HOYT, Samuel W., Jr. (Feb. 9, 1904), Civil Engineer, 34 Washington St., South Norwalk, Conn.

HUBBARD, Charles E. (Associate Member, Aug. 17, 1909), 160-170 Front St., Hartford, Conn.

HULBERT, R. S. See "Honorary Members."

HULL, William H. (Aug. 11, 1914), Civil Engineer, The Merritt-Chapman & Scott Corporation, New London, and *for mail,* 333 Ocean Ave., New London, Conn.

HUSTED, Howard G. (Feb. 21, 1922), Assistant Engineer, New Haven Gas Light Co., or 97 Main St., West Haven, Conn.

HYMEN, [illegible] N. (Aug. [illegible]), [illegible] Engineering Co., 235 Gunter Hotel, San Antonio, Texas.

IMMICK, Hollis D. (Aug. 9, 1921), President and General Manager The Immick Construction Co., 240 East Main St., Meriden, Conn.

INESON, Frank (Feb. 19, 1918), Civil Engineer, Scovill Manufacturing Co., 310 Lincoln St., Waterbury, Conn.

INGE, Reginald G. (Associate Member, Feb. 17, 1920), 177 Westminster St., Springfield, Mass.

JACKSON, J. Frederick (Jan. 9, 1900), Consulting Engineer, 185 Church St., New Haven, Conn., Director of Bureau of Sanitary Engineering, State Department of Health, Hartford, Conn.

JAYNES, Frank B. (Feb. 10, 1903), Frank B. Jaynes, Inc., 201 Watson Bldg., Bridgeport, Conn.

JOHNSON, Carl V. (Aug. 9, 1921), Buck & Sheldon, Inc., Hartford, 185 Bond St., Hartford, Conn.

JOHNSON, Frederick H. (Feb. 18, 1919), 1846 Superior St., Toledo, Ohio.

JOHNSON, James F. (Feb. 17, 1920), Engineering Department, N. Y., N. H. & H. R. R., 1119 Central Ave., Bridgeport, Conn.

JOHNSON, William D. (Aug. 14, 1900), President, Johnson & Burns, Inc., Architects, 26 State St., Hartford, Conn.

JOHNSON, William E. (Nov. 29, 1890), Division Engineer, Water Dept., Hartford, and *for mail,* West Hartford, Conn.

JOHNSTON, Merwin M. (Aug. 8, 1917), Civil Engineer, Connecticut Co., and *for mail,* 191 Alden Ave., New Haven, Conn.

JONES, Walter A. (Feb. 10, 1903), Central Pennsylvania Coal Producers Assn., Altoona, Pa.

JONES, Walter M. (Associate Member, Feb. 15, 1916, Active Member, Feb. 17, 1920), Civil Engineer, 21 Silver St., Middltown, Conn. P. O. Box 924.

JORDAN, James O., Jr. (Associate Member, Aug. 11, 1920), Waldo Bros. & Bond Co., 181 Congress St., Boston, Mass.

KEITH, Herbert C. (Jan. 9, 1900), Consulting Engineer, 15 Park Row, New York, N. Y.

KELLEY, Raymond E. (Feb. 15, 1916), Civil Engineer, The J. H. Ellison Construction Co., Hartford, and *for mail,* 17 Forest St., Hartford, Conn.

KELLOGG, Henry J. See "Honorary Members."

KELLY, P. James (Associate Member, Feb. 17, 1920), The Connecticut Quarries Co., New Haven, and *for mail,* 100 Pendleton St., New Haven, Conn.

KENNEDY, Dennis A. (Associate Member, Aug. 13, 1913), 73 Tremont St., Boston, Mass.

KENT, Gilbert R. (Aug. 16, 1910), Civil Engineer, 71 Smith St., West Haven, Conn.

KENYON, Herbert W. (Feb. 17, 1920), U. S. Engineer, River and Harbor Work, R. D. No. 1, Waterford, Conn.

KERR, John J. (Associate Member, Aug. 11, 1920), Bridge and Track Work, 58 Waverly St., New Haven, Conn.

KILBY, Charles C. (Feb. 14, 1912), Superintendent A. C. Sternberg, Inc., West Hartford, Conn., and *for mail,* 148 Madison St., Hartford, Conn.

KIMBALL, Paul P. (Feb. 17, 1920), City Engineer's Office, Hartford, Conn.

KIRBY, Richard Shelton (March 30, 1900), Assistant Professor of Drawing and Descriptive Geometry, Sheffield Scientific School, Yale University, New Haven, Conn.

KIRCHBERGER, Ralph B. (Feb. 21, 1922), City Engineer's Office, Waterbury, or R. F. D. No. 1, Thomaston, Conn.

KNIGHT, George A., (Feb. 15, 1921), The Collins Co., Collinsville, Conn.

KNOX, Chester A. (Feb. 17, 1920), Designing and Mapping Track Layouts, N. Y., N. H. & H. R. R., Madison, Conn.

LA FORGE, Frederick W. See "Honorary Members."

LAMBERT, Edward Allyn (Feb. 10, 1914), Chief Engineer, The Austin Company, Bridgeport, Conn.

LANE, E. LeRoy (Jan. 8, 1901), Contractor, Hingham, Mass.

LANE, John J. (Associate Member, Feb. 17, 1920), Director of Public Works. New Haven. P. O. Box 733, New Haven, Conn.

LANGDON, Frederick S. (Aug. 11, 1920), Secretary and Treasurer, Bilderbeck & Langdon, Architects and Engineers, Barrows Building, New London, Conn.

LANNAN, James M. (Feb. 15, 1921), Assistant Director of Public Works, 207 Williams St., Middletown, Conn.

LARRABEE, Harold D. (Feb. 17, 1920), General Manager, The Eastern Connecticut Power Co., Norwich, and *for mail*, 77 McKinley Ave., Norwich, Conn.

LAUPER, John H. (Feb. 21, 1922), City Engineer's Office, or 16 Albion St., Waterbury, Conn.

LAURSON, Philip G. (Feb. 21, 1922), Assistant Professor of Engineering Mechanics, Yale University, 37 Knight St., Whitneyville, Conn.

LAW, Walter H. (Aug. 10, 1904), Civil Engineer, 158 Cypress St., Providence, R. I.

LAWLER, Edward Stanley (Feb. 18, 1919), Connecticut State Highway Department, New Milford, Conn.

LEIGHTON, Kenneth W. (Feb. 14, 1911), Consulting Engineer, 82 Church St., New Haven, and *for mail*, 317 Edgewood Ave., New Haven, Conn.

LEWIS, George B. (Aug. 11, 1920), Civil Engineer, North Haven, Conn.

LEWIS, Merton B., Jr. (Feb. 17, 1920), Assistant Superintendent, The H. Wales Lines Co., Meriden, Conn., and *for mail*, 7 Walnut St., Westerly, R. I.

LITTLE, Douglas G. (Feb. 21, 1922), City Engineer's Office, or 1054 West Main St., Waterbury, Conn.

LOCHRIDGE, Elbert E. (Aug. 23, 1905), Chief Engineer, Water Works, Springfield, and *for mail*, Box 1238, Springfield, Mass.

LOEWE, D. Carl (Feb. 15, 1921), Division Engineer, State Highway Department, P. O. Box 179, Winsted, Conn.

LOTZ, Edwin H. (Feb. 15, 1921), Mackenzie & Lotz, Southington, Conn.

LUTZ, Frederick W. (Feb. 10, 1914), Civil Engineer, 96 Hobart St., New Haven, Conn.

LYLES, Henry E. (Feb. 17, 1920), Connecticut Power Co., Housatonic Division, Canaan, Conn.

LYNCH, Alexander S. (Aug. 14, 1907), Engineer and Designer of Amusement Parks, 57 Holmes Street, West Haven, Conn.

LYON, C. Tyler (Feb. 17, 1920), Assistant Engineer, N. Y., N. H. & H. R. R. Co., 416 Dixwell Ave., New Haven, Conn.

MACDONALD, John A. (Feb. 18, 1919), Inspector N. Y., N. H. & H. R. R. Telegraph Department, 164 White St., Hartford, Conn.

MACKENZIE, A. Maxwell (Aug. 7, 1918), P. O. Box 406, Yalesville, Conn.

MacKENZIE, Samuel H. (Feb. 9, 1915), Engineer and Superintendent, Water Department, Southington and Terryville Water Co., 102 Center St., Southington, Conn. P. O. Box 446.

MacKENZIE, William A. (Aug. 11, 1914), Borough Engineer and Superintendent Water Department, or 390 North Main St., Wallingford, Conn.

MacKENZIE, William P. (Feb. 17, 1920), Assistant Engineer, Maintenance of Way, N. Y., N. H. & H. R. R., New Haven, and *for mail*, 1251 Quinnipiac Ave., New Haven, Conn.

MacLEAN, George H. (Feb. 9, 1904), Treasurer, The Sperry Engineering Co., 82 Church St,. New Haven, and *for mail*, 56 Brownell St., New Haven, Conn.

MACONI, G. Vincent (Feb. 17, 1920), Estimating Engineer, Dwight Building Co., 67 Church St., New Haven, or 462 Second Ave., West Haven, Conn.

MAGILL, C. A. (Aug. 14, 1907), General Manager, Connecticut Hassam Paving Co., 902 Chapel St., or P. O. Box 230, New Haven, Conn.

MANVILLE, E. Perry (Feb. 14, 1912), 143 North Whitney St., Hartford, Conn.

MARCHANT, Orson H. (Feb. 14, 1905), Civil Engineer, 100 Crown St., New Haven, and *for mail*, 241 Alden Ave., New Haven, Conn.

MATHER, Robert H. (Aug. 9, 1921), Buck & Sheldon, Inc., 60 Prospect St., Hartford, or Windsor Locks, Conn.

McCARTHY, Edward A. (Feb. 15, 1916), Civil Engineer, 158 Black Rock Ave., New Britain, Conn.

McCARTHY, Timothy D. (Associate, July 30, 1919), Roadmaster Connecticut Co., Waterbury, Conn.

McCLUSKEY, Charles A. (Aug. 13, 1913), Special Agent, Southern New England Telephone Co., Hartford, and *for mail*, 154 Hallock Ave., New Haven, Conn.

McCLUSKEY, Trevor P. (Feb. 17, 1920), Real Estate and Right of Way Engineer, N. Y., N. H, & H. R. R. Co., New Haven, Connecticut Ave., Colonial Park, West Haven, Conn.

McCRONE, Harvey B. (Feb. 21, 1921), City Engineer's Office, Waterbury, Conn., or P. O. Box 202, Watertown, Conn.

McDONALD, Charles E. (Feb. 14, 1912), 114 Benedict St., Waterbury, Conn.

McDONALD, George N. (Feb. 21, 1922), Civil Engineer, 35 Yates Ave., Waterbury, Conn.

McDONOUGH, Frank T. (Feb. 10, 1914), Field Engineer, Southern New England Telephone Co., New Haven, and *for mail*, 38 Hallock St., New Haven, Conn.

McDOWELL, Allan (Feb. 17, 1920), Civil Engineer, Kent, Conn.

McDOWELL, Edwin T. (Aug. 8, 1917), Superintendent Water Department, Middletown, Conn.

McELROY, James A. (Feb. 9, 1909), City Engineer, and *for mail*, 307 Golden Hill, Bridgeport, Conn.

McINTOSH, Harold S. (Feb. 17, 1920), Engineering Department, N. Y., N. H. & H. R. R., 314 General Office Bldg., New Haven, Conn., or *for mail*, 1099 Campbell Ave., West Haven, Conn.

McKAIG, F. Paul (Aug. 11, 1914), Civil Engineer, The Connecticut Co., Hartford, and *for mail*, 182 Whitney St., Hartford, Conn.

McKENZIE, A. Maxwell (Aug. 7, 1918), Pittsburgh-Des Moines Co., Curry Bldg., Pittsburgh, Pa.

McKENZIE, Thomas (Feb. 12, 1907), Engineer and Superintendent, Water Department, Westerly, R. I.

McKNIGHT, John T. (May 31, 1893), Retired from business, Rockville. Residence, Ellington, Conn.

McLAUGHLIN, Frank (Feb. 15, 1916), Civil Engineer, Address unknown.

MEEKER, Reginald C. (Feb. 9, 1915), Transmission Engineer's Office, New Eng. Tel. Co., Boston, Mass.

MEHLS, Bernard A., Jr. (Feb. 15, 1921), with A. B. Hill, 100 Crown St., or 310 York St., New Haven, Conn.

MERIAN, Philip Ambrose (Feb. 17, 1920), City Engineer's Office, New Britain, and *for mail*, North Haven, Conn.

MERRELS, Charles W. (Jan. 9, 1900), Assistant Engineer, City Engineer's Office, New Haven, Conn.

MERRITT, Malcolm (Aug. 12, 1908), Daly & Merritt, Contracting Engineers, Port Chester, N. Y.

MESSIER, Charles J. (Feb. 17, 1920), The C. A. Sibley Co., 902 Chapel St., New Haven, Conn.

MILLER, Clyde A. (Feb. 10, 1914), Coe Brass Co., Torrington, or 235 Riverside Ave., Torrington, Conn.

MILLER, Irving C. (Feb. 19, 1918), 175 Southmayd Road, Waterbury, Conn.

MILLER, Rodney B. (Feb. 9, 1909), Civil Engineer, 222 Hamilton St., Harrisburg, Pa.

MINOR, Edward E. (Feb. 9, 1904), Superintendent, New Haven Water Co., New Haven, Conn.

MINOR, [illegible] ([illegible]), Assistant Engineer, S. E. Minor, Greenwich, Conn.

MINOR, Sheldon E. (Sept. 25, 1886), Civil Engineer, 96 Greenwich Ave., Greenwich, Conn.

MITCHELL, R. E. (Jan. 9, 1900), City Engineer, 751 Main St., Willimantic, Conn.

MIX, Albert F. (Aug. 11, 1920), Wreckmaster, The Merritt-Chapman & Scott Corporation, New London, and *for mail,* 14 Perry St., New London, Conn.

MONAGHAN, Frank J. (Feb. 21, 1922), Engineer, Waterbury Gas Light Co., or 89 Ridgewood St., Waterbury, Conn.

MOREHOUSE, Allison F. (Associate Member, Aug. 8, 1916), Superintendent of Buildings, 22 Church St., Meriden, and *for mail,* 14 Breckenridge Ave., Meriden, Conn.

MOSS, Ernest B. (April 20, 1901), Civil Engineer, H. Wales Lines Co., or 235 Liberty St., Meriden, Conn.

MUNSON, Clarence A. (Feb. 17, 1920), Engineer, New Haven Trap Rock Co., New Haven, and *for mail,* 1426 Boulevard, New Haven, Conn.

MURPHY, Frank J. (Associate Member, Feb. 15, 1921), The Bridgeport Dredge & Dock Co., Connecticut National Bank Bldg., Bridgeport, Conn.

MURPHY, Harold T. (Feb. 9, 1904), Civil Engineer and Surveyor, 54 Winthrop St., Springfield, Mass.

MURPHY, John P. (July 18, 1890), Assistant Engineer, Department of Engineering, Hartford, and *for mail,* 39 Wethersfield Ave., Hartford, Conn.

MURRAY, Henry H. (Feb. 17, 1920), Electrical Engineer, 39 Boylston St., Boston, Mass.

MYLCHREEST, George L. (Feb. 15, 1916), Designing Engineer, Buck & Sheldon, Inc., Hartford, and *for mail,* 238 Palm St., Hartford, Conn.

MYLCHREEST, J. Warren (July 25, 1922), City Engineer and Director of Public Works, 33 Brainerd St., Middletown, Conn.

NASH, George E. (Feb. 17, 1920), Real Estate Engineer, N. Y., N. H. & H. R. R., 56 Lake Pl., New Haven, Conn.

NASH, Paul (Jan. 9, 1900), City Engineer, Stamford, Conn.

NATHAN, Robert H. (Aug. 9, 1921), Buck & Sheldon, Inc., Hartford, or Windsor Locks, Conn.

NETTLETON, Edward S. (Feb. 17, 1920), City Engineer, New Haven, Conn.

NEUHAUS, Theodore F. (Feb. 15, 1921), Buck & Sheldon, Inc., Hartford, or Windsor Locks, Conn.

NEWLANDS, James A. (Feb. 15, 1916), President, Henry Souther Engineering Co., 11 Laurel St., Hartford, Conn.

NEWMAN, Alden G. (Feb. 20, 1917), Member of Office Force A. B. Hill, 100 Crown St., New Haven, Conn.

NICHOLS, Morris B. (Feb. 18, 1919), Civil Engineer, Milford, Conn.

NICKELS, Herbert L. (Feb. 18, 1919), Engineer, Highway Construction, West Hartford, Conn.

NICKERSON, C. H. (July 25, 1922), City Engineer, Torrington, Conn.

NOERR, Robert Collyer, Greenwood & Noerr, Consulting Engineers, 847 Main St., Hartford, Conn.

OLMSTED, Horace B. (Feb. 20, 1917), Assistant Engineer, State Highway Department, *mail,* Darien, Conn.

OLMSTED, C. Henry (July 18, 1899), Civil Engineer, 1175 Main St., East Hartford, Conn.

ORROK, Geo. A. (Feb. 9, 1909), Consulting Engineer, 17 Battery Place, New York, N. Y., and *for mail,* Irving Pl. and 15th St.

PALMER, Shepard B. (Jan. 8, 1895), Civil Engineer, 161 Main St., Norwich, Conn.

PALMER, William B. See "Honorary Members."

PARKER, George A. (July 18, 1899), Superintendent of Parks, Municipal Bldg., Hartford, Conn.

PARKHURST, Roger W. (Aug. 9, 1921), The Barber Asphalt Paving Co., 1900 Land Title Bldg., Philadelphia, Pa.

PARSONS, Harold A. (Aug. 14, 1900), Civil and Consulting Engineer, Engineering Contractor, 49 Bank St., Stamford, Conn.

PATIENCE, Frederick G. (Feb. 9, 1909), Contracting Engineer, Berlin Construction Co., Berlin, and *for mail,* 25 Plainfield St., Hartford, Conn.

PATTERSON, Charles A. (Feb. 11, 1919), Mascetti & Holley, Contractors, Torrington, Conn.

PATTON, Arthur J. (Sept. 12, 1889), Land Surveyor, 27 West Main St., Waterbury, Conn.

PAYNE, Morris B. (Feb. 14, 1911), Payne, Griswold & Keefe, Architects and Engineers, Manwaring Bldg., New London, Conn.

PEARSON, Edward J. (Feb. 17, 1920), President, N. Y., N. H. & H. R. R., 207 General Office Bldg., New Haven, Conn.

PECK, Ermon M. (Jan. 8, 1895), Civil Engineer, 260 Edgewood St., Hartford, Conn.

PECK, Leon F. (Oct. 11, 1902), Superintendent of Streets, Hartford, Conn.

PENFIELD, George W. (Jan. 8, 1901), Assistant Engineer, Board of Water Commissioners, Hartford, and *for mail*, New Hartford, Conn.

PERRY, George W. (Aug. 11, 1914), Civil Engineer and City Engineer, City of Putnam, 15 Providence St., Putnam, Conn.

PETRUCELLI, Louis M. (Feb. 21, 1922), City Engineer's Office, New Haven, Conn.

PFENNIG, Clair M. (Aug. 9, 1921), Treasurer Sperry & Buell, Inc., 129 Meadow St., Bristol, Conn.

PHELPS, Howard E. (Aug. 8, 1917), Civil Engineer, New Haven, Conn.

PHILLIPS, J. Warne (Feb. 17, 1920), Connecticut & Rhode Island Co., Inc., Contractors, Meriden, and *for mail*, 30 Hobart St., Meriden, Conn.

PIERCE, Bradford D., Jr. (Aug. 23, 1905), President, The Connecticut Quarries Co., P. O. Drawer 1849, New Haven, and *for mail*, Brooklawn Park, Bridgeport, Conn.

PITCHER, Floyd J. (Feb. 20, 1917), Assistant Engineer of Structures, N. Y., N. H. & H. R. R., 113 Church St., New Haven, and *for mail*, 81 Woodbridge St., New Haven, Conn.

POLAND, Edwin W. (Aug. 8, 1917), Superintendent, C. W. Murdock Co., or 505 Grand Ave., New Haven, Conn.

POMEROY, Harlan D. (Aug. 8, 1916), Superintendent of Highways and Bridges, Town Hall, Darien, Conn.

PORISS, Solomon C. (Aug. 13, 1913), Connor & Poriss, Hartford, and *for mail*, 54 Oakland Terrace, Hartford, Conn.

PRANN, C. Perry (Aug. 8, 1916), City Engineer, Meriden, Conn.

PRANN, Raymond W. (Aug. 8, 1917), Roadmaster, Connecticut Co., New Haven, Conn.

PRENTIS, Hugh L. (Feb. 10, 1914), Groton, Conn.

PRESTON, Charles H., Jr. (Feb. 12, 1907), Architect & Engineer, 136 Grand St., Waterbury, Conn.

PRICE, Charles E. (Associate Member, July 30, 1919; Active Member, Feb. 17, 1920), Engineer on Road Construction, Portland Cement Association, P. O. Box 1068, New Haven, Conn.

PUNDERFORD, John K. (Jan. 9, 1900), Vice President and General Manager, The Connecticut Co., P. O. Box 1311, New Haven, Conn.

QUAY, John P. (Aug. 12, 1915), Structural Engineers, Berlin Construction Co., Berlin, and *for mail*, 10 Camp St., New Britain, Conn.

QUIRK, Louis F. (Feb. 21, 1922), Estimator, Berlin Construction Co., Middletown, Conn.

RANDLE, Jonathan S. (Feb. 14, 1911), Civil Engineer, 100 Crown St., New Haven, and *for mail*, 227 Sherman Ave., New Haven, Conn.

RAPUANO, Joseph H. (Aug. 11, 1914), Civil Engineer, Connecticut Co., New Haven, and *for mail*, 592 Chapel St., New Haven, Conn.

RASK, Peter K. (Feb. 15, 1916), Transitman, City Engineer's Office, Hartford, and *for mail*, 17 Crown St., Hartford, Conn.

REED, Louis (Feb. 15, 1921), Division Engineer, Winsted, Conn.

REID, Malvern E. (July 25, 1922), Connecticut State Highway Department, or 48 Oak St., Hartford, Conn.

RICE, Alfred H. (Associate Member, Feb. 18, 1919), New Britain, Conn.

RICE, Arthur W. See "Honorary Members."

RICH, Richard H. (Aug. 11, 1914), Assistant Engineer, Department of Real Estate, N. Y., N. H. & H. R. R., New Haven, and *for mail*, 414 Goffe St., New Haven, Conn.

RICHARDS, Howard S. (Aug. 11, 1914), Civil Engineer, Huntington St., New London, Conn.

RICHMOND, Charles P. (Feb. 21, 1922), Assistant Engineer, N. Y., N. H. & H. R. R. Co., 164 West Main St., Waterbury, Conn.

RIPLEY, Herbert L. (Feb. 17, 1920), Corporation Chief Engineer, N. Y., N. H. & H. R. R., 350 Chestnut St., Brockton, Mass.

ROBINSON, Leoni W. (Feb. 14, 1905), Architect, 42 Church St., New Haven, Conn.

ROBINSON, Ralph M. (Aug. 8, 1917), Civil Engineer, Connecticut Quarries Co., 152 Temple St., New Haven, Conn.

ROBINSON, Seymour N. (Feb. 9, 1904), 145 Oxford St., Hartford, Conn.

ROBISON, Wayne (Associate Member, Aug. 7, 1918), Robison & Powers, Inc., Meriden, Conn.

ROGERS, Charles E. (Feb. 12, 1907), Professor, Civil Engineering, Trinity College, Hartford, Conn.

ROOT, Charles A. (Feb. 21, 1922), City Engineer's Office, or 53 Myrtle St., Waterbury, Conn.

ROOT, Judson B. (Feb. 21, 1922), City Engineer's Office, or 217 Ashley St., Hartford, Conn.

ROOT, S. Leonard (Feb. 17, 1920), Superintendent of Highways, Fairfield, Conn.

ROSS, Robert J. (Feb. 9, 1915), Assistant City Engineer, Municipal Building, Hartford, and *for mail*, 575 New Britain Ave., Hartford, Conn.

ROWLAND, Henry L. (Feb. 18, 1919), City Hall, Bridgeport, Conn.

RUDD, E. Irvine (Aug. 7, 1918), Engineer, Public Utilities Commission, Maple Ave., Glenbrook, Conn.

RUTHERFORD, Arthur N. (Associate, Feb. 18, 1919), Building Inspector, 620 Stanley St., New Britain, Conn.

RYDER, E. M. T. (Jan. 9, 1900), Engineer, Maintenance of Ways, Third Avenue Railway Co., New York, N. Y.

SAGE, George H. (Jan. 8, 1895), President, Berlin Construction Co., Berlin, and *for mail*, Ledyard Road, Hartford, Conn.

SAUNDERS, Richard L. (Feb. 9, 1909), Deputy State Highway Commissioner, Hartford, and *for mail*, 232 Sigourney St., Hartford, Conn.

SAVILLE, Caleb M. (Aug. 12, 1915), Chief Engineer, Board of Water Commissioners, 1026 Main St., Hartford, Conn.

SCHILLLING, Albert H. (Aug. 14, 1906), Contracting Engineer, Berlin Construction Co., New Britain, and *for mail*, 29 Lincoln St., New Britain, Conn.

SCOTT, Thomas A. (Aug. 11, 1914), Pequot Ave., New London, Conn. President The Merritt-Chapman & Scott Corporation, New York, N. Y.

SEARS, Selden P. (Feb. 14, 1912), C. W. Blakeslee & Sons, Colchester, Conn.

SEGUR, Raymond H. (Feb. 20, 1917), Overseer, Street Dept., Municipal Bldg., Hartford, and *for mail*, 67 Farmington Ave., Hartford, Conn.

SELLERS, Philip (Feb. 9, 1904), Architect, 207 Orange St., New Haven, and *for mail*, 227 McKinley Ave., New Haven, Conn.

SELLNER, William J. (Associate Member, Feb. 17, 1920), Office of Construction Engineer, Connecticut Co., 58 Whalley Ave., New Haven, Conn.

SENIOR, Samuel P. (Feb. 17, 1920), Chief Engineer and Vice President, Bridgeport Hydraulic Co., 820 Main St., Bridgeport, Conn.

SHARP, W. H. (Aug. 11, 1914), Town Engineer and Foreman of Public Works, West Hartford, Conn.

SHAUGHNESSY, James F. (Feb. 11, 1902), Assistant Engineer, Board of Water Commissioners, Hartford, Conn.

SHAUGHNESSY, William J., Jr. (Associate Member, Feb. 17, 1920), General Manager, Eastern Engineering & Construction Co., Bridgeport, Conn.

SHELDON, Paul (Feb. 12, 1907), Buck & Sheldon, Inc., Consulting Engineers, Hartford, and *for mail*, P. O. Box 184, Hartford, Conn.

SHEPHERD, Edward W. (Aug. 11, 1920), The Merritt-Chapman & Scott Corporation, New London, Conn.

SHOOK, Berton (Feb. 15, 1916), Civil Engineer, City Hall, Bridgeport, or 158 Blakeman Pl., Stratford, Conn.

SIBLEY, Charles A. (Feb. 11, 1908), Contracting Engineer, 902 Chapel St., New Haven, Conn.

SKILTON, Henry I. (Aug. 8, 1917), Division Engineer, City Engineer's Office, or 103 Allen Pl., Hartford, Conn.

SMEAD, Ralph A. (Feb. 15, 1916), Structural Engineer, Buck & Sheldon, Inc., or 364 Laurel St., Hartford, Conn.

SMINCK, Charles S. (Associate Member, July 25, 1922), Plainfield, N. J. Mailing address, The Lawrence Cement Co., 302 Broadway, New York City.

SCOTT-SMITH, Francis Harvey (Feb. 21, 1922), City Engineer's Office, Waterbury, Conn., or Platts Mills, Naugatuck, Conn.

SCOTT-SMITH, Herbert (Feb. 21, 1922), City Engineer's Office, or 87 White Oak Lane, Waterbury, Conn.

SCOTT-SMITH, L. Theodore (Feb. 21, 1922), La Salle, N. Y.

SMITH, Frank M. (Aug. 23, 1905), Engineer, C. W. Blakeslee & Sons, New Haven, Conn.

SMITH, George E. (Feb. 10, 1903), Division Engineer, State Highway Department, Bank Bldg., New Milford, Conn.

SMITH, Lewis L. (Aug. 11, 1920), Manager, The Merritt-Chapman & Scott Corporation, New London, and *for mail*, 545 Ocean Ave., New London, Conn.

SMITH, John Henry (Feb. 18, 1919), State Highway Department, P. O. Box 196, Colchester, Conn.

SMITH, Raymond W. (Aug. 9, 1921), City Engineer's Office, Hartford, or Tunpis Ave., Bloomfield, Conn.

SMITH, William G. See "Honorary Members."

SOEHRENS, J. H. (Aug. 10, 1914), Valuation Engineer, N. Y., N. H. & H. R. R., Wallingford, Conn.

SPENCER, Norman C. (Jan. 8, 1901), Spencer & Washburn, Civil Engineers, 573 Main St., Hartford, Conn.

SPENCER, Paul B. (Feb. 9, 1915), Engineer of Structures, N. Y., N. H. & H. R. R., 132 Richards St., West Haven, Conn.

SPENCER, Walter T. (Jan. 9, 1900), Superintendent, N. Y., N. H. & H. R. R., Taunton, and *for mail*, 15 Claflin Road, Brookline, Mass.

SPERRY, A. William (Jan. 9, 1900), Contracting Engineer, 82 Church St., New Haven, Conn.

SPRAGUE, John V. (Feb. 11, 1913), Engineering Contractor, The Hudson Paving Co., 2875 Broadway, New York, N. Y.

STABELL, Frederick P. (Feb. 15, 1921), Vice President Samuel W. Hoyt, Jr., Co., Inc., Engineers & Surveyors, 34 Washington St., South Norwalk, Conn.

STAHL, Paul A. (Aug. 9, 1921), The Berlin Construction Co., Berlin, or 260 Corbin Ave., New Britain, Conn.

STARK, Melvin E. (Aug. 11, 1914), Superintendent of Tracks, The Connecticut Co., Bridgeport, *mail*, 3335 Main St., Stratford, Conn.

STARKWEATHER, Walter H. (Feb. 11, 1913), Civil Engineer, P. O. Box 789, Bridgeport, Conn.

STEELMAN, Martin Somers (Feb. 15, 1916), Resident Engineer, Levering & Garrigues, Bristol, Conn., *mail*, 73 Vernon St., Hartford, Conn.

STEIN, Louis P. (Feb., 1922), City Engineer's Office or 89 Ward St., New Haven, Conn.

STERLING, Paul (Oct. 11, 1902), Division Engineer, N. Y., N. H. & H. R. R. Co., East 132d St., and Willis Ave., New York, N. Y., and *for mail*, 654 Savin Ave., West Haven, Conn.

STEVENS, Robert W. (Feb. 8, 1910), Division Engineer, State Highway Dept., Hartford County, *mail*, 408 Main St., Hartford, Conn.

STEWART, Alanson E. (Feb. 10, 1914), Supt. in charge of Jitneys, Public Utilities Commission, 139 Linnmoore St., Hartford, Conn.

STONE, Edward M. (July 18, 1899), Private Business, 327 Trumbull St., Hartford, Conn.

STORRS, Henry W. (Aug. 23, 1905), Hartford Iron Works, Inc., P. O. Box 1028, Hartford, Conn.

STORRS, Lucius S. (Feb. 17, 1920), President, The Connecticut Co., New Haven, Conn.

STORY, I. Franklin (Aug. 21, 1912), Resident Engineer, Waterbury, and *for mail*, 67 Montgomery St., Waterbury, Conn.

SUCHER, Theodore R. (Feb. 17, 1920), Superintendent of Gas Distribution, New Haven Gas Co., Whitneyville P. O., Conn.

SULLIVAN, John M. (Aug. 10, 1904), Plant Engineer, Whittaker & Glessner Co., 2524 Archington St., Chicago, Ill.

SUMNER, Leslie G. (Feb. 17, 1920), Connecticut Highway Department, 368 Woodland St., Hartford, Conn.

SUNDERLIN, George W. (Associate Member, Feb. 14, 1911), Secretary and Treasurer, The Bridgeport Dredge & Dock Co., General Contractors, Connecticut National Bank Bldg., Bridgeport, Conn.

TAYLOR, Charles F. (Aug. 12, 1908), Division Engineer, State Highway Department, Hartford, and *for mail*, 48 Church St., Middletown, Conn. P. O. Box 924.

TAYLOR, George B. (Feb. 9, 1915), Designing Engineer, Berlin Construction Co., Berlin, and *for mail*, 96 Harrison St., New Britain, Conn.

TAYLOR, George Britton (Feb. 18, 1919), 101 Dwight St., New Haven, Conn.

TAYLOR, William T. (Feb. 9, 1904), Civil Engineer, 81 Sigourney St., Hartford, Conn.

TERRILL, Arthur P. (Feb. 20, 1917), Central Romana, La Romana, Dominican Republic, West Indies, and *for mail*, 154 Mason St., Greenwich, Conn.

TERRY, Alfred H. (Feb. 11, 1900), Civil Engineer, Bridgeport, Conn., *mail*, 886 Main St., Bridgeport, Conn.

THAYER, Merwin A. (Feb. 14, 1912), Civil Engineer, 23 West Clay St., Winsted, Conn.

THAYER, Raymond E. (Feb. 14, 1912), Civil Engineer, 90 School St., New London, Conn.

THOMAS, James B. (Jan. 9, 1900), Civil Engineer, 34 Capen St., Hartford, Conn.

TIPPET, Henry J. (Aug. 8, 1917), Assistant Engineer, Connecticut Co., and *for mail*, 253 Central Ave., New Haven, Conn.

TODD, James W. (Associate Member, Aug. 16, 1910), Kimberly Ave., New Haven, Conn.

TONER, James A. (Aug. 23, 1905), Superintendent of Public Works, Meriden, and *for mail*, 99 Windsor Ave., Meriden, Conn.

TOOCKER, L. Edmund (Feb. 18, 1919), 20 North St., Milford, Conn.

TOOLE, John F. (Associate Member, Feb. 14, 1911), Toole & Sunderlin, Bridgeport, Conn.

TRACY, John C. (Jan. 9, 1900), Professor of Civil Engineering, Yale University, New Haven, and *for mail*, 345 Winthrop Ave., New Haven, Conn.

TRAVIS, Frank M. (Feb. 9, 1915), Civil Engineer, Torrington, Conn.

TROWBRIDGE, Frederick J. (Feb. 14, 1912), Consulting Engineer, 35 Coniston Ave., or 168 Grand St., Waterbury, Conn.

TRUESDELL, Walter E. (June 11, 1898), Secretary and Vice President, J. H. Wallace & Co., Industrial Engineers, 5 Beekman St., New York City.

TUCKER, John J. (Feb. 9, 1915), Mahoney & Tucker, 29 Weybosset St., Providence, R. I.

TURNER, Albert M. (Aug. 10, 1905), Field Secretary, Connecticut State Park Commission, Northfield, Conn.

TURNER, Homer R. (Feb. 20, 1917), Superintendent and Engineer, Windsor Water Board, Windsor, Conn.

TUTTLE, Leon E. (Feb. 18, 1919), Assistant City Engineer, Stamford, Conn.

ULRICH, W. Leroy (Aug. 14, 1913), Superintendent of Repairs, State Highway Department, Hartford, and *for mail,* 101 Ridgefield Street, Hartford, Conn.

UNKELBACH, Max J. (Jan. 9, 1900), Civil Engineer and Architect, Unkelbach & Perry, 162 Main St., P. O. Box 607, New Britain, Conn.

VAUGHN, Edward J. (Feb. 15, 1916), Civil Engineer, with Buck & Sheldon, Inc., 60 Prospect St., Hartford, and *for mail,* 26 Adelaide St., Hartford, Conn.

VERRILL, G. E. (Feb. 11, 1902), 1048 Whitney Ave., Route [illegible], New Haven, Conn.

WADHAMS, Joseph Palmer (Feb. 9, 1904), Assistant Engineer, Public Utilities Commission, 1584 Chapel St., New Haven, Conn.

WADHAMS, M. Allyn (Feb. 10, [illegible]), 80 Sherman St., Hartford, Conn.

WALLER, William E. (Feb. 9, 1915), Box 90, Chestnut Hill, R. F. D. No. 1, Bridgeport, Conn.

WARDWELL, Virgil E. (Feb. 15, 1921), The F. S. Wardwell Co., Box 145, Stamford, Conn.

WATERMAN, Charles P. (Feb. 11, 1908), Charles P. Waterman, Inc., 75 Pratt St., Hartford, Conn.

WATERMAN, Irville D. (Feb. 19, 1918), Construction Engineer, N. Y., N. H. & H. R. R., New Haven, Conn.

WATROUS, Kenneth (Feb. 14, 1911), Civil Engineer, Groton, Conn.

WATSON, Edmund B. (Aug. 11, 1914), Sunderland & Watson, Architects, 98 Park Ave., Danbury, Conn.

WATSON, William C. (Feb. 17, 1920), Bridge Department, N. Y., N. H. & H. R. R., New Haven, and *for mail,* 45 Smith St., West Haven, Conn.

WATTERS, George E. (Feb. 14, 1911), Civil Engineer, City Sewer and Water Works, P. O. Box 327, New London, Conn.

WEBB, D. J. Henry (Aug. 7, 1918), Connecticut National Pavements, Inc., 173 Orange St., New Haven, Conn.

WELDEN, Elmer C. (Feb. 18, 1919), State Highway Department, 106 Elm St., New Haven, Conn.

WELLINGTON, Alexander M. (Feb. 17, 1920), City Engineer's Office, New Haven, Conn.

WELLS, Alden (Feb. 15, 1916), Assistant Engineer, Department of Engineering, Hartford, and *for mail,* 40 Freeman St., Hartford, Conn.

WHEELER, Charles A. (Jan. 8, 1901), Professor of Mathematics and Engineering for the Connecticut Agricultural College, Storrs, Conn.

WHEELER, Ralph A. (Feb. 21, 1922), Civil Engineer, Coulter St., Oakville, Conn.

WHITLOCK, Henry C. (Feb. 21, 1922), City Engineer's Office, Waterbury, Conn., or Naugatuck, Conn.

WHITNEY, Eli (March 30, 1900), President, New Haven Water Co., 800 Whitney Ave., New Haven, Conn.

WHITNEY, Stephen (Associate Member, Aug. 11, 1920), Secretary and Treasurer, Connecticut National Pavements, Inc., 173 Orange St., New Haven, Conn.

WHITON, Frank W. (Associate Member, Feb. 14, 1905), Whiton & McMahon, Architects, 36 Pearl St., Hartford, Conn.

WHITTEMORE, J. E. (Feb. 9, [illegible]), Civil Engineer, N. Y., N. H. & H. R. R. Co., Danbury Division, P. O. Box [illegible], Danbury, Conn.

WIGGIN, Ernest W. (March 30, 1900), Consulting Engineer, 113 Church St., New Haven, Conn.

WIGHTMAN, Herbert B. (Aug. 16, 1910), Civil Engineering, 1 Elmwood Ave., Norwich, Conn.

WILLIAMS, Hiram F. (Aug. [illegible]), Civil Engineer, 172 East Main St., Waterbury, Conn.

WILLIAMS, John C. (Feb. 18, 1919), Civil Engineer, 374 Union Ave., West Haven, Conn.

WILLIAMS, Joseph D. (Feb. 15, 1916), Assistant Engineer, Department of City Engineering, New Britain, and *for mail,* 54 Garden St., New Britain, Conn.

WILLIAMS, Philip K. (Aug. 14, 1906), Secretary, J. B. Williams Co., Glastonbury, Conn.

WILLIS, John F. (July 25, 1922), Civil Engineer, 12 Washington St., Hartford, Conn.

WILSON, P. Ney (Aug. 14, 1913), Montauk Apartment, Ocean Ave., Brooklyn, N. Y.

WINSLOW, C.-E. A. (Aug. 8, 1916), Professor of Public Health, Yale Medical School, New Haven, and *for mail,* 202 Prospect St., New Haven, Conn.

WOLCOTT, Henry A. (July 18, 1899), Mechanical and Civil Engineer, West Hartford, Conn.

WOOD, William J. Jr. (Feb. 21, 1922), Plant Engineer, The F. S. Wardwell Co., Stamford, Conn., or Westport, Conn.

WOODS, John J. (Feb. 10, 1914), Civil Engineer, Baltic, Conn.

WORTHEN, Albert Louis (Feb. 15, 1916), Superintendent The Connecticut Quarries Co., Drawer 1849, or 56 Alden Ave., New Haven, Conn.

WRIGHT, George E. (Feb. 17, 1920), 78 West 8th Ave., Gloversville, N. Y.

WRIGHT, F. Walden (Aug. 12, 1908), Town Engineer, Hamden, Conn.

WYNNE, Harold G. (Feb. 17, 1920), City Engineer's Office, New Haven, Conn.

YOUNG, Guilford D. (Feb. 20, 1917), 263 Elm St., West Haven, Conn.

Geographical List of Members

Names are usually arranged under place of business

CONNECTICUT

Fairfield County

BRIDGEPORT—F. L. Black, E. L. Dargan, H. C. Elton, L. Evans, A. D. Fuller, C. B. Hamil, F. B. Hastings (Assoc. M.), G. A. Hellwig, W. S. Hewlett (Assoc. M.), F. W. Howard, F. B. Jaynes, J. F. Johnson, E. A. Lambert, J. A. McEroy, F. J. Murphy (Assoc. M.), W. B. Palmer, B. D. Pierce, Jr., H. L. Rowland, S. P. [illegible], W. J. Shaughnessy, Jr. (Assoc. M.), B. Shook, M. E. Stark, W. H. Starkweather, G. W. Sunderlin (Assoc. M.), A. H. Terry, J. F. Toole (Assoc. M.), W. E. Waller.

DANBURY—C. O. Brown, E. B. Watson, J. S. Whittmore.

DARIEN—H. B. Olmsted, H. D. Pomeroy.

EAST NORWALK—R. D. Haven.

FAIRFIELD—S. L. Root.

GLENBROOK—E. I. Rudd.

GREENWICH—J. W. Cone, J. L. Gregory, P. L. Minor, S. E. Minor, A. P. Terrill.

NORWALK—H. B. Bussing, Jr.

SHELTON—T. W. Beard, D. E. Brinsmade, M. B. Nichols.

SOUTH NORWALK—D. B. Eula, S. W. Hoyt, Jr., F. B. Stabell.

STAMFORD—G D. Arthur, W. H Arthur, E. H. Beard, P. Nash, H. A. Parsons, L. E. Tuttle, V. E. Wardwell, J. C. Williams, W. J. Wood, Jr.

STRATFORD—A. M. Beardsley, H. L. Beers.

Hartford County

BERLIN—C. B. Baldwin, J. E. Boylan, C. F. Chase, J. T. Hart, C. W. Heusted, F. G. Patience, J. P. Quay, G. H. Sage, A. H. Schilling, P. A. Stahl.

BLOOMFIELD—A. C. Hall.

BRISTOL—C. W. Buell, C. M. Pfennig.

EAST HARTFORD—L. B. Comstock, C. F. Gifford, C. H. Olmsted.

ELMWOOD—J. Craig.

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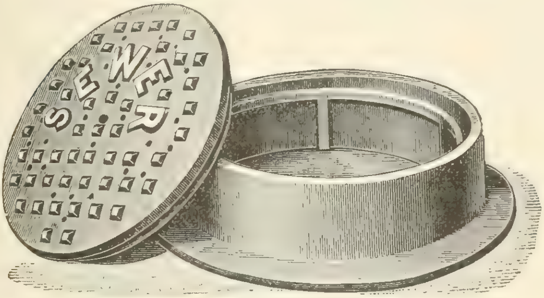

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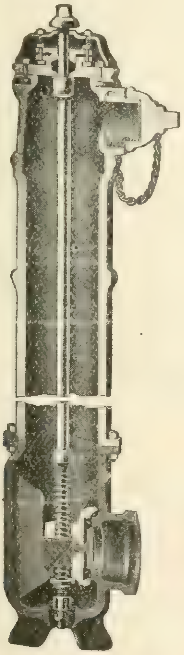

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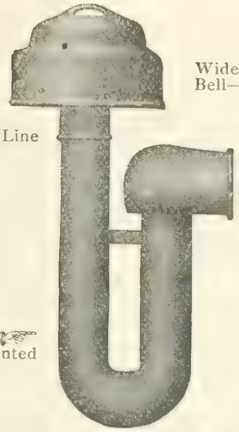

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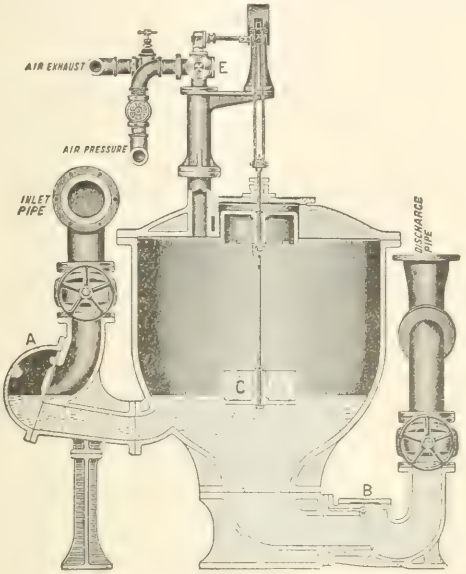

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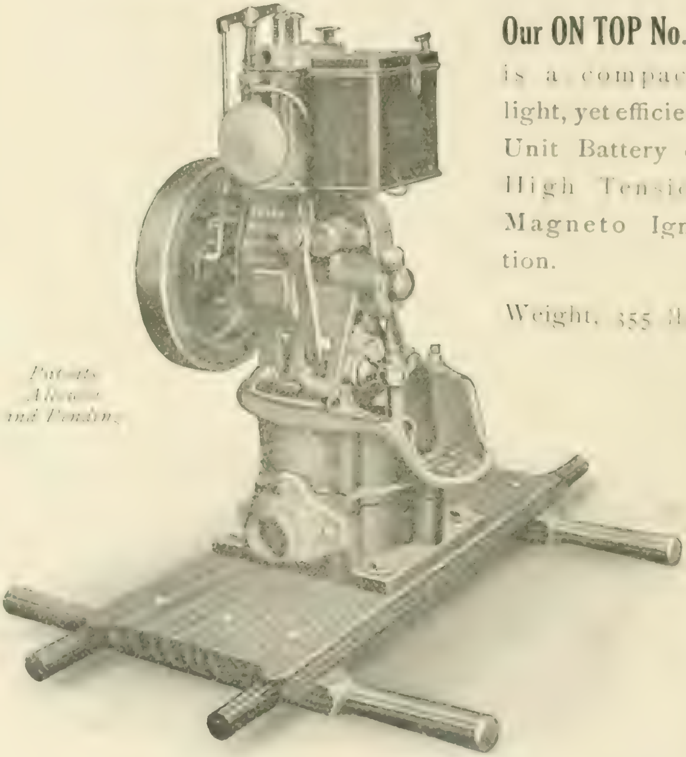

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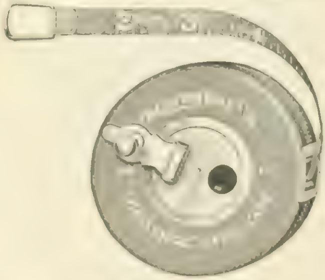

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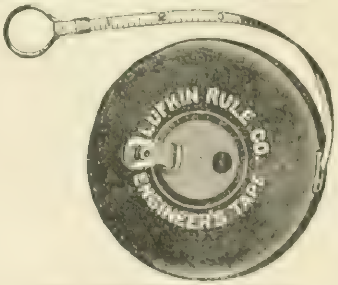

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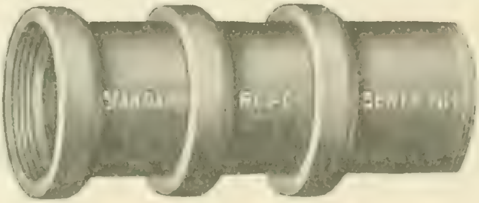

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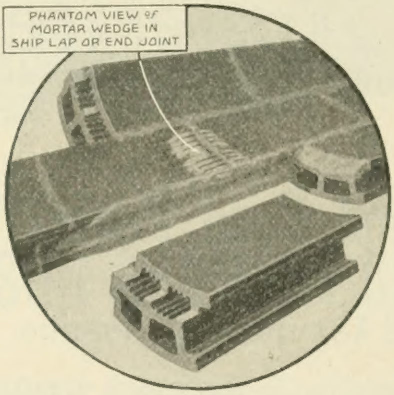

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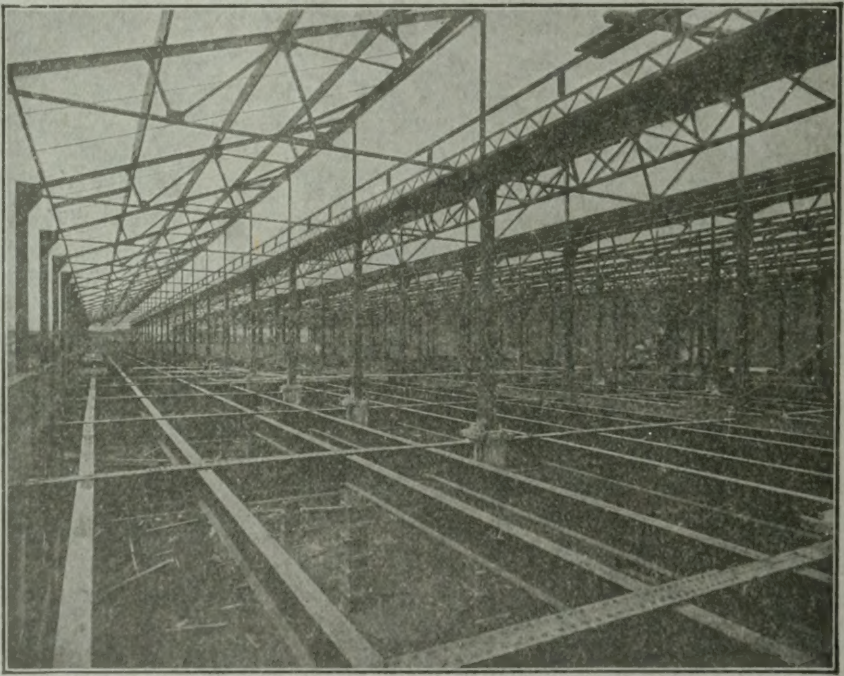

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